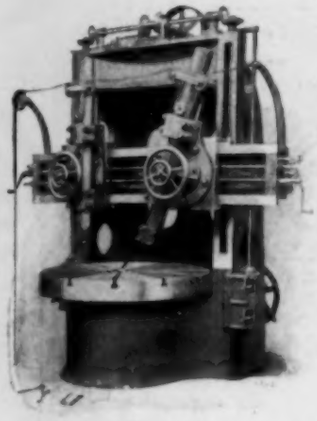
GENERAL LIBRARY,
UNIV. OF MICH.
DEC 1 1904

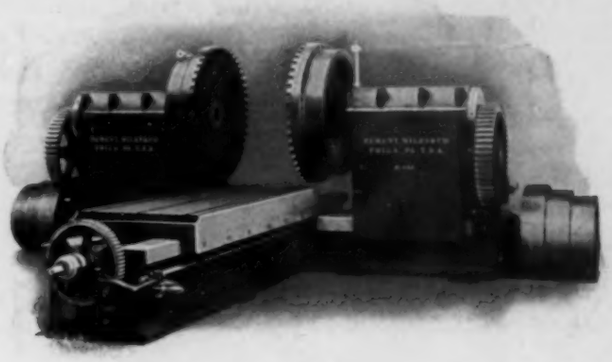
THE IRON TRADE REVIEW

A Weekly Journal Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

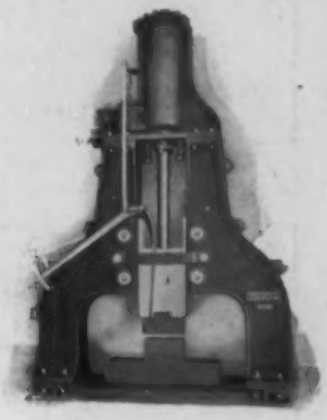
VOLUME XXXVII — CLEVELAND, OHIO, DECEMBER 1, 1904 — NUMBER 48



51-inch Boring Mill



Duplex Milling Machine



5,000 lb. Steam Hammer

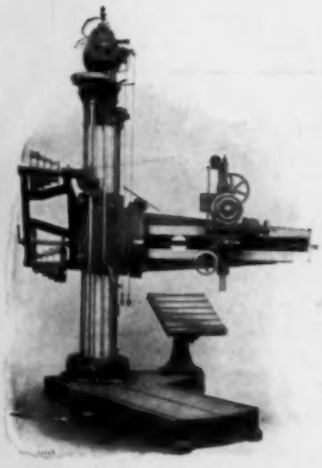
HEAVY MACHINE TOOLS

for use with

Modern High-Power Tool-Steels

3-ton Niles Electric Traveling Hoist

NILES ELECTRIC TRAVELING CRANES and HOISTS



5½-foot Universal Radial Drill

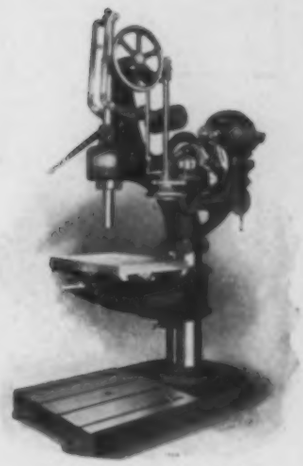
Awarded Grand Prize Louisiana Purchase Exposition

Niles-Bement-Pond Co.

136-138 Liberty St., NEW YORK, U. S. A.

— OFFICES —

BOSTON, 144 Pearl St.
ST. LOUIS, 516 North Third St.
CHICAGO, Western Union Building
PHILADELPHIA, 21st and Callowhill Sts.
PITTSBURGH, Frick Building
LONDON, 23-25 Victoria St., S. W.



50-inch Vertical Drill

CHICAGO DROP FORGE & FDRY. CO.

WORKS ESTABLISHED 1880

DROP FORGINGS

OF ALL KINDS

KENSINGTON, ILLS.

38 minutes South of Chicago by Ills. Central R. R. Suburban trains.

Fire Brick, Fire Clay, Pig Iron. P. R. STEVENS, Detroit, Mich.

Steel and Malleable Castings

True to pattern. Quality unsurpassed. Steel will harden like tool steel.

Acme Steel & Malleable Iron Works

BUFFALO, N. Y.

TURNBUCKLES

CLEVIS NUTS

CLEVELAND CITY FORGE & IRON CO.

CLEVELAND, OHIO.

MEADVILLE MALLEABLE IRON CO.,

MEADVILLE, PA.

MALLEABLE CASTINGS of any description.

SATISFACTION GUARANTEED.

F. A. EMMERTON,

Chemist, Assayer and Metallurgist.

Ores sampled at lake ports, mines and furnaces. Mines and Metallurgical Processes Examined. Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.

9 Bratenahl Building, CLEVELAND, O.

AIR COMPRESSORS CATALOGUE GRATIS

AMERICAN AIR COMPRESSOR WORKS

NO. 26 CORTLANDT ST., NEW YORK

The Canton Malleable Iron Co.

MALLEABLE CASTINGS OF ALL KINDS.

CANTON, OHIO.

DROP FORGINGS

Oil Burners, Forges and Crucible Furnaces for Crude Oil Equipment.

Railway Braces, Railway Track Tools, Forged Steel Picks,

Track Wrenches, Steam Hammer Forgings.

Union Drop Forge Co., 68-70 E. Ohio St., CHICAGO, ILL.

Fuel and power cost money **ECONOMY** is an important feature of

INGERSOLL-SERGEANT MACHINERY

AIR COMPRESSORS PNEUMATIC TOOLS ROCK DRILLS

THE **INGERSOLL-SERGEANT** DRILL CO.

Cleveland, O. Chicago, Ill. St. Louis, Mo. J 6

26 CORTLANDT STREET NEW YORK

Boston, Mass. Pittsburg, Pa. Philadelphia, Pa.

IMPERIAL

Riveters and Chippers and Air Hoists.

NEW CIRCULAR NO. 14 JUST OUT.

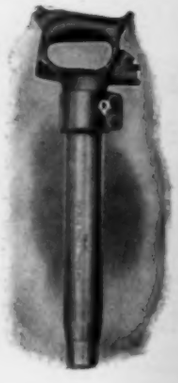
IMPERIAL

Piston Drills and Wood Borers.

RAND DRILL CO.

128 Broadway New York.

Write for Prices.



THE IRON TRADE REVIEW

VOLUME XXXVII CLEVELAND, OHIO, DECEMBER 1, 1904 NUMBER 48

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Actual developments from week to week, as well as the well-founded expectation that 1905 is to be a year of large consumption of iron and steel in the United States, give a very strong tone to the market. In the past week a further advance in Northern pig iron has taken place and bar iron is from $1 to $2 higher, while old material has advanced in all markets. These constitute the changes so far as prices are concerned, though other advances are impending; but the feature of chief import is the increasing confidence in the holding power of the new basis on which the market has been established, to say nothing of the belief entertained in some quarters that the familiar history of undue and too rapid advances on an upward swing of the market is yet to repeat itself.

While the number of pig iron buyers the past week was small compared with that of a month or six weeks ago, they represented in not a few cases large consuming capacity, and the size of their purchases at the newly established level indicates how unexpected the upturn was, as was also the ability of producers to get successively higher prices in recent weeks. A large machinery interest in the Pittsburg district has bought 12,000 tons at an advance over last week's price, and Central Western pipe works have taken 20,000 to 25,000 tons, some of this iron being on the basis of $15 at furnace for Northern No. 3. Northern furnaces have all put up prices in the week, and at $16 now asked for No. 2 at Central Western furnaces, are in some markets on a parity with $13 No. 2 Birmingham. Southern sellers who held for $13.50 are thus 50 cents above the Northern price in many localities, but are nevertheless holding firm and intimating that their price will be $14 in the near future. It would appear that foundries generally are carrying more iron than has been their practice throughout this year, and this fact may give the impression to furnaces, as the stocks they have long carried are diminished, that consumption is greater than the actual. Foundries as a rule have had no such change for the better in their business as might be inferred from what has taken place in pig iron. There is improvement, but as yet it is nowhere pronounced, and much of the buying is on expectations, which it is to be said are confident. It would seem that Northern furnaces are rather better sold for the first quarter than those in the South. Bessemer iron has advanced to $15.25 and $15.50 at Central Western furnaces, with furnacemen less concerned than some months ago as to the future requirements of the Steel Corporation. The latter is starting three furnaces this week in addition to two last week. Coke prices continue to advance and a factor in the Connellsville market is a long-time contract of the Lackawanna Steel Co. indicating that no large dependence will be put on its own mines and ovens for many months.

The mills have booked so heavily in recent weeks that a firmer market has resulted, even in lines not sharing to any large extent in the buying movement. The rail situation has been the key to the next moves in finished material prices. It now seems certain that $28 will be the price for 1905 and that the pending questions relating to the Buffalo interest have been settled satisfactorily. The railroads have not been willing to make any changes in freight rates on iron and steel, and with the announcement of the 1905 rail price after the meeting of the rail association, to be held next week, a large rail tonnage is expected to be placed. A steel bar meeting will occur early in December and an advance of $2 a ton is a practical certainty. Plates and shapes will come up for consideration before the middle of December and an advance of $2 to $4 will probably be made in both. The structural business of the past two weeks has been good, and the outlook for 1905 is assuring, considering that promise of building cannot be well developed at the opening of December.

The railroads have furnished to a very large extent the reasons for the confident expectations formed of the steel trade of 1905. Steel car orders have been increased in the past week, the Pennsylvania adding 5,000 cars to the total of 6,800 placed in the three months preceding. Bars have been by far the largest item in the tonnage booked in recent weeks, jobbers being large buyers. How much of the business placed is speculative, time will determine, but the mills have exerted themselves to reduce this element to a minimum. Bar iron has advanced $2 a ton further and 1.55c Pittsburg is now the price of the leading producer. High scrap made the position of iron rolling mills far from comfortable at the old price for their product.

Among advances expected, which may be effective by the time this review is read, is one of $2 to $4 on wire goods and $2 a ton on wire nails. Another advance in merchant pipe is also looked for.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Nov. 30.

After three months of unusual activity in the iron and steel trade, demand is beginning to subside and the lull following the greatest buying movement experienced in the iron trade in eighteen months is already being felt. Consumers have generally covered requirements as far into the future as the mills would permit and if they take out the tonnage for which they have contracted there can no longer be any doubt as to the strength of the general situation. On the other hand, the mills are convinced that speculative buying was indulged in, but to what extent the future alone will disclose. The tonnage of iron and steel bars contracted for was heavier than any other line for the reason that manufacturers permitted consumers to cover requirements through the first half of next year. In none of the other finished lines was this permitted. The buying of boiler tubing was limited to April 1, of merchant pipe to the first of the year, of wire products to sixty days, while deliveries of sheets, billets, sheet and tin bars were not contracted for beyond February.

The merchant furnaces in the Valleys are comfortably

filled through the first quarter, and if there are to be lower prices there is no indication of a lower basis at the present writing. Two Valley furnaces have their entire output sold through May, while the output of another is taken through the first half of the year. Several large contracts for iron have been placed during the week with Valley producers, two Ohio consumers buying approximately 15,000 tons for first quarter delivery. One local interest also bought to April, the aggregate of Northern, Southern and Virginia amounting to about 10,000 tons. Of this amount Valley furnaces received about 7,000 tons. Bessemer iron is now firmly established on a basis of $15.25 to $15.50, furnace; No. 2 foundry, $15.50 to $16; basic, $15 to $15.25, and forge, $14.50 to $15. This is a further advance over prices prevailing a week ago, despite the fact that the buying movement was by no means unusually heavy.

The railroad interests continue to contribute their share towards establishing the iron market on a better basis, the Pennsylvania Railroad having placed an additional order for 5,000 steel cars during the week, while one of the iron ore roads placed an order for 1,000 cars. Within three months the Pennsylvania lines have contracted for 11,800 cars and further buying is anticipated. As a result steel car works are operating at a greater capacity than at any time in a year and mills are already receiving heavy specifications for plates and angles. In the construction of the 6,000 cars contracted for last week 60,000 tons of rolled steel products will be required.

It is reported that a meeting of the rail pool will be held in New York next Tuesday for the purpose of fixing the price of standard sections for next year. According to late reports the allotment to be granted the Lackawanna Steel Co. has not been definitely decided upon but it is probable that it will be either 15 or 17½ percent. Indications also point to a maintenance of the present price, as the railroads do not view with favor a reduction in tariffs in exchange for slightly lower rail prices. A meeting of the steel bar association is also looked for early in December for the purpose of advancing prices about $2 a ton. Meetings of the plate and structural associations will also be held about the middle of the month, the leading producers favoring an advance of $2 and possibly $4. Iron bars for early delivery are held at 1.60c Pittsburg, but it is a question how long this price can be maintained in view of the great differential existing in favor of the steel product. For forward delivery bar iron is quoted 1.55c.

The Carnegie Steel Co. continues to increase its active pig iron producing capacity, three idle furnaces having come in this week and two last week. Of the 51 furnaces operated by this company only nine are idle, the percentage of active furnaces being as great as during any of the boom periods in the last few years. In the tin plate trade more than 100 mills operated by the American Sheet & Tin Plate Co. resumed operations within the last ten days and the remaining idle mills will be in before the first of the year. Persistent reports of a car shortage are not borne out by existing conditions. Few of the mills are handicapped in this way, and while box cars are scarce as they usually are at this season, little trouble is experienced in securing gondolas and flats for the movement of the heavier shapes. The reservoirs in the Connellsville coke regions have not yet been replenished by the much longed for rainfall, but this handicap has had no apparent effect on production, which continues at the rate of 260,000 tons weekly. That the Lackawanna Steel Co. is not going to place much dependence on its by-product coking plant is indicated by the contract for Connellsville coke entered into with one of the leading producers in the region. It is reported that it covers a period of three years and calls for the shipment of 1,000 tons daily or an aggregate of 1,000,000 tons. It is reported that the price was about $1.80.

Pig Iron.—The Westinghouse Electric & Mfg. Co. figured as the largest buyer of iron during the week, taking about 12,000 tons for first quarter requirements. Virginia furnaces received 2,500 tons at $14 at the furnace, or $16.55 Pittsburg for No. 2. Southern furnaces took 500 tons for which $13 Birmingham or $17.35 Pittsburg, was paid. The remainder went to Valley furnaces at prices ranging from $15.85 to $16.10, Pittsburg. Two Ohio consumers also purchased 15,000 tons of No. 2 for which they were compelled to pay $15.50 at furnace for the same delivery and small lots have sold as high as $16.00 or $16.85 Pittsburg. Bessemer iron is held on the basis of $15.25 to $15.50 furnace for any delivery, but there have been few transactions during the week. Basic is held at $15 to $15.25 at the furnace while forge is quoted at $14.50 to $14.75. Low phosphorus iron is quoted at $21 Pittsburg, but most of the recent buying was at a much lower basis. This week the Carnegie Steel Co. blew in furnaces E and F at the Edgar Thomson plant and the Niles furnace at Niles, O. Last week one stack at New Castle and one at Sharon, both new, became producers. At present this company only has nine of its 51 furnaces idle and this includes two new furnaces at Donora which have never been operated. We revise quotations as follows:

Bessemer, Valley	$15 25 to 15 50
Bessemer, Pittsburg	16 10 to 16 35
No. 1 Foundry	16 75 to 17 00
No. 2 Foundry	16 35 to 16 85
Gray Forge, Pittsburg	15 35 to 15 60
Basic, Valley	15 00 to 15 25
Basic, Pittsburg	15 85 to 16 10

Steel.—Contracts for the delivery of billets and bars after February are not acceptable to the mills except at a premium and if the market continues on the present basis for several weeks it would not be surprising to see another advance when the meetings of the various associations are held in New York in December. We make the following quotations: Bessemer and open-hearth billets, 4 x 4 inches, and slabs, up to and including 0.25 carbon, $21, f. o. b. mill, Pittsburg; with actual freight to points of delivery; 0.26 and including 0.60 carbon, $1 advance; 0.61 to 1.00 carbon $2 advance. Billets smaller than 4 x 4 inches, $2 advance; sheet and tin bars, $23; cut bars, $23.50; forging billets, $23. Bessemer and open-hearth steel rods are held at $27 to $28.

Ferro-Manganese.—Demand has improved and somewhat better prices are being received. We quote domestic ferro, 80 percent at $41.50 to $42, in carload lots, delivered at buyer's mill, any point east of the Mississippi.

Spelter.—The market has advanced during the week and prime western grades are held at 5.73 to 5.75c, Pittsburg, in carload lots.

Muck Bar.—We note the sale of 500 tons of muck iron at $26 Valley mill or $26.85, Pittsburg.

Skelp.—Demand for skelp continues heavy and prices continue to advance. Grooved steel is held at 1.35c to 1.40c and sheared at 1.45c to 1.50c. Grooved iron is held at 1.55c to 1.60c and sheared at 1.65 to 1.70c.

Rails and Track Material.—A meeting of the rail pool is scheduled to be held in New York next Tuesday. It is probable that present prices will be reaffirmed. The membership of the Lackawanna Steel Co. in the pool on an allotment of 15 to 17½ percent is also practically assured. Higher prices on light rails are looked for, as the large steel companies are pretty well filled up on the low prices that have been prevailing. Most of the rerolling mills are idle, as they have been unable to make a profit at the prices that have been ruling. We make the following quotations: Standard sections, 50 lb. and over, in lots of 500 tons and over, $28; car lots and less than 500 tons.

$30; less than car lots, $32; light rails, 12 lb., $24; 16 to 25 lb., $22.50; 25 to 45 lb., $20.50. Spikes, 1.60c to 1.65c.

Plates.—The Pennsylvania Railroad placed an additional order for 5,000 steel cars during the week, making a total of 11,800 cars ordered in the past few months. Additional cars will soon be ordered by this company. One of the iron ore roads also purchased 1,000 cars. The McKees Rocks plant of the Pressed Steel Car Co. resumed operations in full this week while the Cambria Steel Co. and the Standard Steel Car Co. are booked from four to five months in the future. Local mills are now receiving heavy plate specifications from the car plants to fill recent orders. Several of the plate mills at Homestead are down for repairs and but for the lack of demand on the part of the boiler and tank trades the plate market would be unusually strong. A meeting of the plate association will be held about the middle of December and it is probable that prices will be advanced from $2 to $4 a ton. We make the following quotations: Tank plates, ¼ in. thick, 6¼ to 24 in., inclusive, 1.30c f. o. b. mill Pittsburg; over 24 in. up to 100 in., 1.40c. Extras are as follows per pound: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 in. up to 110 in width, not less than 5c per 100 lbs. extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates, 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, $2 extra; gauges 7 and 8, $3 extra; No. 9, $5 extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except the Pacific Coast.

Structural Material.—Steel car works are placing heavy orders for angles with all the mills and but for this tonnage the local structural mills would be unusually slack. Owing to the low basis prevailing on structural shapes in comparison with steel billets it is probable that prices will be advanced from $2 to $4 a ton at a meeting to be held about the middle of December. We make the following quotations: Beams and channels up to 15 in., 1.40c; over 15 in., 1.50c; angles, 3 x 2 up to 6 x 6, 1.40c; zees, 1.40c; tees 1.45c; angles, from 3 to 16 in., 1.40c; universal and sheared plates, 6¼ to 24 in., inclusive, 1.30c; over 24 in., 1.40c base.

Sheets.—Demand for sheets continues heavy and few of the mills are willing to quote through the first quarter at prevailing prices. Most of the plate mills are operating in full, and the outlook is unusually bright. We make the following quotations on 500 bundle lots: Black sheets, one pass, No. 8, 1.70c; No. 9, 1.75c; Nos. 12 to 14, 1.80c; Nos. 15 to [illegible] 1.90c; Nos. 18 to 21, 1.95c; Nos. 25 to 26, 2.05c; No. 27, 2.10c; No. 28, 2.20c; No. 29, 2.50c No. 30, 2.60c. Galvanized: Nos. 16 to 17, 2.50c; Nos. 18 to 21, 2.55c; Nos. 22 to 24, 3c; Nos. 25 to 26, 3.05c; No. 27, 3.10c; No. 28, 3.25c; No. 29, 3.60c; No. 30, 4c.

Tin Plate.—In the past ten days the American Sheet & Tin Plate Co. placed more than 100 of its idle tin plate mills in operation and at present about 200 of its 242 mills are in operation. The activity of these mills is unusual for this season of the year and the indications are that this activity will be followed by a shutting down of mills early next year. We quote 100-pound coke plates at $3.45 per box, f. o. b. mill Pittsburg. A discount of 5 cents a box is allowed to large buyers.

Bars.—At a meeting of the steel bar manufactures to be held early in December it is expected prices will advance about $2 a ton. All of the large buyers have covered requirements to the middle of next year, so that the advance will do the mills little good. On iron bars the leading interest has made another advance of $1 a ton and is now quoting 1.50¾c, Pittsburg. Some of the independent mills are, however, quoting under this price. We quote: Bar iron, 1.55c to 1.59¾c Pittsburg; hoops, 1.55c, and bands, 1.30c, both taking bar extras. Bessemer steel bars, 1.30c; open-hearth steel bars, 1.35c; plow and cultivator beams, 1.30c, net; channels, angles, zees and tees, under 3 in., 1.40c. The following differentials are maintained on steel: Less than 2,000 lb. of a size and not less than 1,000 lb., 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Wire and Wire Nails.—Jobbers' stocks are unusually heavy for this season of the year, most of them having bought heavily previous to the late advance. A curtailment of production is expected at an early date. We make the following quotations: Wire nails, jobbers' carload lots, $1.70; retailers' carloads, $1.75, and less than carloads, $1.85; painted barb wire, $1.85 to jobbers in carloads; retailers' carloads, $1.90, and less than carloads, $2, with 30 cents for galvanizing. Annealed smooth fence wire is held at $1.55, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron and cut nails are held at $1.75 and steel $1.70.

Merchant Steel.—Demand for shafting is improving and the buying of all classes of merchant steel products for future requirements has been heavy. We revise quotations as follows: Toe calk, 2c; carriage spring steel, 1.85c; tire steel, 1.60c to 1.65c; plow steel, 6 in. and under, 1.35c for Bessemer and open-hearth; plow slabs, ½ in. and heavier, 1.60c to 1.65c. Drawn and cold rolled shafting is held at 52 percent off in carload lots and 47 off in less than carload lots.

Pipes and Tubes.—Another advance on merchant pipe is looked for this week. None of the mills are taking orders for delivery after the first of the year, while contracts on boiler tubing is limited to April 1. Discounts to consumers, carload lots, f. o. b. Pittsburg, plus freight to destination acording to Tube Rate Book, are as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	69	53	67	51
¾ to 6 inches	77	67	75½	65½
⅛ and ½ inch	73	61	71	59
7 to 12 inches	72	57	70½	55
Extra Strong Plain Ends.				
⅛ to ¾ inch	63	50	60	48
½ to 4 inches	69	57	67	55
4½ to 8 inches	65	53	63	51
Double extra strong plain ends, ½ to 8 inches	59	47	56	45

MERCHANT BOILER TUBES, LESS CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1½ inches	46	43
1¾ to 2¼ inches	58	43
2½ inches	60	48
2¾ to 5 inches	66	55
6 to 12 inches	58	43

Old Material.—Little material has changed hands during the week and there has been few changes in prices. Stocks of dealers are heavier than ever but they will not dispose of their material except at prices proportionate to those prevailing on pig iron. We make the following quotations gross tons: Heavy melting stock, $14.75 to $15; cast scrap, $13.50 to $13.75; No. 1 wrought scrap, $15 to $15.25; iron borings, $8.50 to $9; re-rolling rails, $15 to $15.25; sheet scrap, bundled, $12 to $12.25.

Coke.—The Lackawanna Steel Co. is reported to have contracted for 1,000 tons of coke daily for the next three years from one large Connellsville producer. The condition of the company's coal property and by-product plant is the direct cause of this move. Foundry coke for delivery through the first half of next year is now held on the basis of $2.35 to $2.50 and furnace at $2.10 to $2.25. Despite the shortage of water the coke production continues normal, the upper region having produced 196,541 tons during the week ending Nov. 19, while the output of the lower region was 64,644 tons.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1104 MONADNOCK BLOCK, Nov. 29.

The report is generally accepted in this city that it has been decided not to make any change in the price of heavy rails for the coming year. It is understood that the Lackawanna Steel Co. and other rail interests have arranged a settlement to the controversy regarding the apportionment of the tonnage, which was the stumbling block to the agreement, the former having accepted 15 percent, the original tender, agreeing also to uphold the association price of $28 a ton. What effect this information when officially announced will have on the railroad interests is problematical. That they have been anticipating a reduction for some months is well known, and a large tonnage has been held up pending a settlement of the question. Specifications for rails under contract have also been coming in very slowly in the past two months, ostensibly for the same reason, and the Illinois Steel Co. was compelled to shut down its rail mill and converting department at South Chicago last Saturday because of lack of orders to work on. It is not thought the railroads can continue much longer in withholding their requirements in this direction and after some needed repairs have been made to the mill, which will require about two weeks, it is expected to have a large enough tonnage on hand to assure continued operation.

The scarcity of specifications for other forms of finished material for prompt shipment has been causing some uneasiness among sellers here. This drawback to an otherwise satisfactory market is particularly noticeable among the lighter forms of material, including sheets, steel bars, merchant steel, light structural shapes, plates, etc. The demand for these products for future delivery is plentiful enough, and some mills have been forced to withdraw from the market because they did not wish to load their books with further tonnage of this character. But what they are anxious to get and what they have been bending every effort to acquire, are orders for material to go into immediate consumption. Each week, it is true, shows an improvement in this respect over that preceding, but the situation yet remains far from satisfactory to the local seller.

Bar iron is the only rolled product to be advanced in the week under review. It has been put up to 1.65c by the leading Western producer. The active buying of cars in the last two weeks has stimulated the demand for this material, and following the sensational advances in scrap, producers had no alternative but to protect themselves by putting up the price of the finished material. Cast iron pipe has advanced $1 a ton and is now quoted on the basis of $27.50 Chicago for 4-in. water pipe. Some softening is noticed in pig iron, and quotations of $13 Birmingham for No. 2 foundry have been made in the past week on Southern iron. The general quotation, however, is $13.50 Birmingham, or $17.15 Chicago, though there has been very little buying at this figure. Northern iron continues to be held at $16 to $16.50 Chicago for No. 2, which has acted as an effective brake in keeping down the sales of Southern iron at $17.15. Connellsville and Wise County (Va.) foundry coke are now quoted at $2.25 to $2.50 at ovens and are strong and scarce. Light rails, track supplies and wire products, have had an excellent demand, some large tonnages for the former having been closed by Western producers at better prices than published quotations. There has also been a brisk demand for axle and forging billets, and no difficulty is felt in obtaining the new prices.

Pig Iron.—Thanksgiving Day gave the local market a breathing spell last week, and the period under review was marked with a quietness not seen here for the past two months. Inquiry was plentiful enough, but was largely from parties testing the strength of present prices, and did not represent bona fide needs. So far, no anxiety has been shown by melters to cover for their requirements at the prices which are current, and it is not believed there will be much further buying until after the first of the year. Practically the entire trade has covered for its wants in the first quarter and the majority of Western melters are content to wait a few weeks longer to see which way the market will go before entering into negotiations for further tonnages. Prices remain substantially without change, Southern iron being held on the basis of $13.50 Birmingham for No. 2 foundry, or $17.15 Chicago; and Northern irons at $16 to $16.50 Chicago for the same grade. Some quotations were made last week by Southern furnaces on the basis of $13 Birmingham for No. 2, and several lots of iron are said to have been sold at this price. These, however, were isolated cases and have not affected the general tone of the market. There are some large tonnages pending, ranging downwards from one of several thousand tons. Demand for spot iron is nil. We quote prices as follows:

Lake Superior Charcoal	$ 17 00
Northern Foundry No. 1	16 50 to 17 00
Northern Foundry No. 2	16 00 to 16 50
Northern Foundry No. 3	15 50 to 16 00
Northern Scotch Foundry	17 00
Ohio Strong Softeners No. 1	17 80 to 18 30
Ohio Strong Softeners No. 2	17 30 to 17 80
Southern Foundry No. 1	17 65
Southern Foundry No. 2	17 15
Southern Foundry No. 3	16 65
Southern Foundry No. 4	16 15
Southern No. 1 Soft	17 65
Southern No. 2 Soft	17 15
Southern Gray Forge	15 90
Southern Mottled	15 90
Southern Silveries (4% to 6% Silicon)	18 15 to 18 65
Jackson Co. Silveries (6% to 8% Silicon)	19 80 to 20 30
Jackson Co. Silveries (8% to 10% Silicon)	20 30 to 20 80
Alabama and Georgia Car Wheel	19 65
Malleable Bessemer	16 50 to 17 00
Basic Iron	17 15

Billets.—For small lots of forging and axle billets, there is a good demand. The new prices are held firm by mills, and in some cases small premiums have been obtained for quick shipments. We quote carload lots, Chicago delivery, as follows: Forging billets, 4 x 4 and larger, up to but not including 10 x 10, $26. Rerolling billets, Bessemer or open hearth, 4 x 4 and larger, up to .25 carbon, $24; up to and including .60 carbon, $1 extra. Billets, 3⅞ in. and smaller, and sheet and tin bars, $26. Wire rods which nominally are quoted $30 Pittsburg, may be shaded about $1 a ton on desirable specifications.

Bars.—Makers of merchant bar iron have been forced to advance their prices to the basis of 1.65c Chicago owing to the rapid advances in the prices of raw material. At this figure they are very conservative in placing new business on their books, and are selling only for deliveries in the near future. Railroads and car builders have been brisk buyers in the last week, the heavy purchases of new rolling stock by nearly all the western roads, having greatly stimulated the demand for this iron. It is estimated that in the neighborhood of 30,000 cars have been ordered in the past few weeks, and at two tons of iron per car, which is the average consumption, it can readily be seen that the car-building interests will be heavy buyers of bar iron for some time to come. Users of steel bars have placed a good sized tonnage with mills for future delivery. Specifications, however, for quick shipment, are not in proportion to the contracting for forward deliveries, and mills are pressing their customers for same. Jobbers have advanced their prices on shipments from store from $1 to $3 a ton, according to the tonnage demanded. We have revised our prices, and quote carload lots, Chicago delivery, as follows: Bar iron, 1.60c to 1.65c (the former price being made on very desirable specifications for quick shipments), soft steel bars and bands, 1.46½c, base, half extras; soft steel angles, less than 3 x 3, 1.56½c; hoops, 1.71½c full extras. Local jobbers quote iron bars, 1.75c to 1.80c, base, full extras; soft steel angles, channels and

tees, at 1.80c to 1.90c, half extras; hoops, 2c to 2.10c rates, full extras.

Sheets.—There is no diminution to be noted in the demand for either black or galvanized sheets, the difficulty being to find mills willing to add to the large tonnages for forward deliveries already on their books. Specifications for quick shipments are not as heavy as could be desired by many, and efforts are being made to improve this feature of the situation. The advance made last week has been well sustained, and many mills are getting the maximum prices quoted below for their product. We quote on carload lots, mill shipments, Chicago delivery, as follows: Nos. 9 and 10, 1.76½c to 1.81½c; Nos. 11 and 12, 1.81½c to 1.86½; Nos. 13 and 14, 1.86½ to 1.91½c; Nos. 15 and 16, 1.96½c to 2.01½c. On box annealed, one pass, cold rolled, we quote Nos. 18 and 20, 2.11½c to 2.16½; Nos. 22 and 24, 2.16½c to 2.21½c; Nos. 25 and 26, 2.21½c to 2.26½c; No. 27, 2.26½c to 2.31½c; No. 28, 2.36½c to 2.41½c; No. 29, 2.46½c to 2.51½c; No. 30, 2.56½c to 2.61½c. Jobbers prices are very firm, and while no concerted action has been taken, some interests are asking $1 a ton and more above the following prices, for lots shipped from stock. As a basis, however, and as fairly representing the local warehouse trade, we quote as follows: No. 10, 1.95c to 2c; No. 12, 2c to 2.05c; No. 14, 2.05c to 2.10c; No. 16, 2.15c to 2.20c; No. 18, 2.30c to 2.35c; No. 20, 2.35c to 2.40c; No. 22, 2.40c to 2.45c; No. 24, 2.45c to 2.50c; No. 26, 2.50c to 2.55c; No. 27, 2.60c to 2.65c; No. 28, 2.70c to 2.75c; No. 29, 2.80c to 2.85c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: No. 12-14, 2.36½; No. 16, 2.51½c; No. 18-21, 2.66½c; No. 22-24, 2.81½c; No. 26, 3.01½c; No. 27, 3.21½c; No. 28, 3.41½c. Jobbers' prices on galvanized sheets from store are as follows: Nos. 10 to 16 inclusive, 2.70c to 2.80c; Nos. 18 and 20, 2.80c to 2.90c; Nos. 22 and 24, 3c to 3.10c; No. 26, 3.20c to 3.30c; No. 27, 3.40c to 3.50c; No. 28, 3.60c to 3.70c; No. 29, 4.05c to 4.15c; No. 30, 4.50c to 4.60c.

Structural Steel.—Mills report that both new business and specifications show a handsome tonnage. The projects requiring structural steel under consideration for construction in the coming year are many, and the indications point to a heavy consumption of this product in this city and vicinity in the near future. Prices are without change, except jobbers' quotations on lots from stock, which are uniformly higher. We quote mill shipments, Chicago delivery, as follows: Beams and channels, 3 to 15 in. inclusive, 1.56½c; angles, 3 to 6 in., ¼-in. and heavier, 1.56½c; angles, larger than 6 in. on one or both legs, 1.66½c; Beams, larger than 15 in., 1.66½c; zees, 3-in. and over, 1.56c; tees, 3-in. and over, 1.61½c, with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. Store prices on structural materials according to tonnage are 1.85c to 2c for angles, beams, channels, base sizes, with 1.95c to 2.05c for 18, 20 and 24-in. beams; tees and zees, 1.90c to 2c. These prices are for either for random lengths or cut to lengths.

Plates.—Demand for this material continues to lag somewhat, though it shows a healthy improvement over what it has been. Mills have ample specifications on their books for nearby deliveries and there is no danger of any shut-downs in the near future. Prices are without change, as follows: Tank steel, ¼-in. and heavier, 24-in. wide, and under, rectangular plates only, 1.46½c base; over 24-in. to 100-in. wide, 1.56½c base; flange steel, 1.66½c base; marine steel, 1.76½c base, all full extras. Plates, 3-16 in. thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. All the local jobbers have advanced their prices on lots from stock, ranging from $1 to $3 a ton, according to the size of the order and delivery required. We have revised our quotations, and now quote as follows: Tank steel, ¼-in. and heavier, 1.85c to 2c; 3-16, 1.95c to 2.05c; No. 8, 1.95c to 2.05c; flange steel, 2.10c to 2.25c.

Rails and Track Supplies.—The rumor is current in this city that the price of rails for the coming year has been practically fixed at $28, and that the disagreement between the Lackawanna Steel Co. and the association has been satisfactorily settled. A large tonnage for standard rails has been pending in this market from Western railroads, estimated at over 300,000 tons, and as soon as official announcement is made as to what the policy will be for 1905, it is expected that the greater portion of this tonnage will be let immediately. Specifications for heavy sections have fallen off in the past two months, the railroads withholding same in anticipation of lower prices, and the rail mill and converting department at the South Works of the Illinois Steel Co. were forced to shut down last Saturday because of a lack of orders to work on. Officials do not know definitely just when the mill will be started up again, as some repairs will be made during the suspension, but it is expected the idle period will not last longer than two weeks at the most. Demand for light rails and track supplies show no diminution, and western manufacturers have booked some large tonnages in the past few days. We continue to quote, as follows: Heavy sections, 500 tons and over, $28; less than 500 tons to carload lots, $30; less than carload lots, $32; second quality rails, $27; light rails, $21 to $23; track supplies, f. o. b. Joliet mill, angle bars, 1.30c; spikes, first quality, 1.60c to 1.65c; track bolts, 3¼ x ¾, with square nuts, 2.25c to 2.30c per 100 lbs; with hexagon nuts, 2.40c to 2.45c.

Merchant Steel.—Mills continue to invite and press for specifications for nearby deliveries, but are loath to add to the already heavy tonnages on their books for forward shipments. This statement sums up the situation in brief in this market. Prices are without change, and we quote mill shipments, Chicago delivery, as follows: Spring steel, 1.85c; sleigh shoe, flat sizes, 1.51½c; concave and convex, 1.60½c to 1.71½c; cutter shoe, 2.25c; smooth finished machinery steel, 1.71½c; smooth finished tire, 1.66½c; plow steel, 2.20c and upwards, according to quality; toe calk steel, 2.01½c; crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up; cold rolled shafting, 52 percent from list in carload lots, and 47 percent discount in less than carload lots.

Merchant Pipe.—Jobbers continue to send in supplementary orders and increased specifications and the outlook is of the brightest for the consumption of pipe. Prices are without change, and we quote mill shipments, random lengths, f. o. b. Chicago, as follows:

MERCHANT PIPE.

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	67.35	51.35	65.35	49.35
⅜ and ½ inches	71.35	59.35	69.35	57.35
¾ to 6 inches	75.35	65.35	73.85	63.85
7 to 12 inches	70.35	55.35	68.85	53.35

Boiler Tubes.—The advance in steel tubes appears to be well sustained, judged by the good volume of business reported by mills and jobbers. New business and specifications are coming in freely. There are no further changes in prices, and we quote mill shipments, Chicago delivery, as follows:

BOILER TUBES.

	L. W. Steel Percent.	C. C. Iron. Percent.	Seamless Steel. Percent.
1 to 1½ inch	44.35	41.35	52.35
1¾ to 2½ inch	56.35	41.35	40.35
2½ inch	58.35	46.35	43.35
2¾ inch to 5 inch	64.35	53.35	Up to 4 inches.
6 to 13 inch	56.35	41.35	50.85

The following are the agreed discounts from store:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches, inclusive	40½	37½	40
1¾ to 2¼ inches, inclusive	50½	35	37½
2½ inches, inclusive	53	37½	40
2¾ to 5 inches, inclusive	60½	47½	47½
6 inches and larger	50½	35	

Cast Iron Pipe.—Orders are of the sprinkling nature, coming from all parts of the country, and usually for small lots. In view of the advanced prices for the raw material, manufacturers of pipe have put up their quotations $1 a ton. We now quote carload lots, Chicago delivery, as follows: 4-in. water pipe, $27.50; 6-in. and larger, $25.50; gas pipe, $1 a ton higher.

Wire Products.—There is no cessation in the demand for all classes of wire materials, and mills are declining to sell beyond 60 days' shipment. Prices are firm, and we quote carload lots to jobbers, Chicago delivery, mill shipments, as follows: Wire nails, 1.85c; painted barb wire, 2c; galvanized barb wire, 2.30c; smooth annealed wire, 1.70c; smooth galvanized wire, 2c; polished staples, 1.95c; galvanized staples, 2.25c. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½ and 5 percent to 85 percent discount f. o. b. Waukegan, Ill., on straight carload lots. Poultry netting, 85 and 5 percent discount from list f. o. b. Joliet and DeKalb, with actual freight allowed not exceeding 30 cents per 100 pounds.

Foundry Coke.—The drought in the South which continues to seriously curtail the production of coke, is stiffening prices and creating a scarcity of fuel. Standard 72-hour Connellsville coke is firm at $2.50 at the ovens, or $5.15 Chicago, and Wise County (Va.) $2.50, or $4.75 Chicago. Some sellers of the latter coke are claiming the differential in freight rate from Wise County ovens to this market, and are quoting this product on the same basis as Connellsville—$5.15 Chicago.

Old Material.—While there have been rapid and almost sensational advances in scrap values in the last few weeks, it cannot be said with truthfulness that consumers are paying or acquiescing in same. It is one thing for dealers to put up prices according to their ideas as to values, and an entirely different proposition when it comes to selling their product at those prices. Consumers are holding their view of the market at about $2 a ton below the prices of dealers and are declining to negotiate except on a basis somewhat in line with their ideas. Railroads and other producers of scrap have profited largely by the recent sharp advances in this material, owing to the fact that a number of dealers found themselves sold short and were anxious to cover. This state of affairs naturally stimulated the bidding on several recent railroad lists with above result. Some reaction has already been felt, and prices have dropped about $1 a ton on old iron and steel rails, splice bars, iron car axles, Nos. 1 and 2 railroad wrought, iron axle turnings, machine shop turnings, and stove plate. We have revised our quotations, and quote dealers' selling prices, as follows:

Old steel rails (4 feet and over)	$16 00 to 16 50
Old steel rails (less than 4 feet)	14 50 to 15 00
Old iron rails	21 00 to 21 50
Relaying rails, subject to inspection	21 50 to 22 50
Relaying rails, subject to inspection	19 00 to 20 00
Old wheels	14 50 to 15 00
Heavy melting steel	13 50 to 14 00
Mixed country steel	9 75 to 10 25
Low phosphorus scrap (.05 and under)	13 50 to 14 00

The following quotations are for net tons:

No. 1 R. R. wrought	16 50 to 17 00
No. 2 R. R. wrought	15 50 to 16 00
Shafting	17 00 to 17 50
Dealers' Forge, No. 1	14 00 to 14 50
Wrought pipe and flues	12 50 to 13 00
No. 1 cast, 150 lb. and less	14 00 to 14 50
No. 1 mill	9 50 to 10 00
Country sheet	8 00 to 8 50
No. 1 boilers, cut	11 00 to 11 50
Boiler punchings	11 00 to 12 00
Iron car axles	20 00 to 20 50
Steel car axles	16 50 to 17 00
Iron axle turnings	11 50 to 12 00
Steel axle turnings	11 50 to 12 00
Cast borings	7 00 to 7 50
Mixed borings, etc.	7 00 to 7 50
Machine shop turnings	11 00 to 11 50
Railroad malleable	12 00 to 12 50
Agricultural malleable	11 50 to 12 00
Stove plate and light cast scrap	10 00 to 11 00
Old iron splice bars	17 00 to 17 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Nov. 30

The statistics of ore shipments for November will be included in those for the season, which will not be known officially for two weeks or more, but it is estimated that during November between 3,500,000 and 4,000,000 tons of ore have been shipped and that the total lake shipments for the season will be about 21,500,000 tons. The all-rail shipments will bring the grand total to more than 22,000,000. Some late comers are still skirmishing for ore, but few sales agents will sell with guaranty of delivery, as they have just reached the point at which they can see their way clear for delivering ore already sold and there is much uncertainty as to how much ore can be shipped before the close of navigation. Insurance expires Dec. 5, and few vessels will sail after that date. Ore in northern docks is fast freezing and is already hard to handle. Some agents say that after the close of the season, they may have some ore to sell, but the amount will not be large. Prices are about as last week, as follows: Old range non-Bessemer, $3 to $3.25; old range Bessemer, $3.65 to $3.75; Mesabi non-Bessemer, $3 to $3.25; Mesabi Bessemer, $3.15 to $3.50.

Freight rates have not changed and it is not expected that any fancy prices will be paid this year at the wind-up of the season, as has sometimes been done.

Pig Iron.—Iron for the first quarter is scarce and some furnaces have so nearly sold their output for the first half of 1905 that they are not soliciting business and are selling to regular customers only about half what they desire to buy. Little, if any, iron can be bought at less than $16 at the stacks for No. 2. Cleveland furnaces have had no difficulty in disposing of all of their iron for spot and first quarter delivery at that price. An illustration of the scarcity of pig iron in this city is furnished by the fact that a shipment of a carload was made from Detroit and delivered in Cleveland at $17.50. The foundryman who has not covered his requirements for the first quarter is compelled to pay high prices. For the limited amount of Southern iron offered, $13.50 is asked for No. 2 Birmingham, and it is not an important factor. Furnace coke for prompt delivery has sold as high as $2.25 to $2.50 and foundry is selling at $2.50 to $2.75. We quote as follows for Cleveland delivery:

Bessemer	$15 60 to 16 10
No. 1 Foundry	16 50 to 17 00
No. 2 Foundry	16 00 to 16 50
No. 3 Foundry	15 50 to 15 75
No. 2 Southern	17 35
Gray Forge	15 25 to 15 50
Gray Forge, Southern	15 50 to 15 85
Lake Superior charcoal	16 50 to 17 00

Finished Material.—Specifications have been coming in much more freely and the market has thereby been strengthened in the one feature which had not been all that might be desired. Steel bars are still quoted at 1.39½c Cleveland for Bessemer, and 1.44½c for open hearth, and, in spite of rumors of an early advance, there is nothing definite on which to base a prediction. Bar iron has been advanced to 1.55c to 1.60c at the mills and in some cases by mills which are short on orders, but say they cannot sell at lower prices on account of the very high price of scrap. Sheet business has been good since the recent advance in prices and the principal producer is so well supplied with orders that it is not anxious to sell for first quarter delivery. The prices of the principal producers through jobbers are as follows: Cleveland delivery, the freight from Pittsburg being 9½ cents: Mill sales of black sheets in car load lots, No. 10, 1.69½c; No. 11-12, 1.74½c; No. 14, 1.79½c; No. 16, 1.89½c; No. 27, 2.24½c; No. 28, 2.34½c. Galvanized mill sales: No. 14, 2.39½c; No. 16, 2.49½c; No. 18-20, 2.63½c; No. 22-24, 2.79½c; No. 25, 2.99½c; No. 27, 3.19½c; No. 28, 3.39½c.

Out of stock, black sheets, ¼ in., 1.70c; 3-16 in., 1.80c. Blue annealed: No. 10, 2c; No. 12, 2.05c; No. 14, 2.10c; No. 16, 2.20c. One pass cold rolled: No. 18-20, 2.35c; No. 22-24, 2.40c; No. 26, 2.45c; No. 27, 2.50c; No. 28, 2.60c; No. 30, 3c. Galvanized out of stock: No. 16, 2.75c; No. 18-20, 2.85c; No. 22-24, 3c; No. 26, 3.20c; No. 27, 3.40c; No. 28, 3.60c; No. 30, 3.40c.

Old Material.—Prices show still further advances on nearly all kinds of scrap. One railroad has sold No. 1 railroad wrought at $16.90 net. We quote as follows, gross tons, Cleveland:

Old iron rails	$20 00 to 21 00
Old steel rails (over 6 feet)	15 50 to 16 50
Old steel rails (under 6 feet)	15 00 to 16 00
Old car wheels	14 50 to 15 50
Steel boiler plate	10 00 to 11 00
Steel axles	17 00 to 18 00
Malleable iron (railroad)	13 50 to 14 50
Malleable iron (agricultural)	12 50 to 13 00
Heavy steel	14 50 to 15 00

We quote as follows, net tons:

No. 1 R. R. wrought	16 50 to 17 00
No. 1 busheling	14 00 to 14 50
No. 1 machine cast	13 00 to 13 50
Iron axles	19 00 to 20 00
Axle turnings	11 50 to 12 00
Wrought turnings (free from cast)	9 00 to 9 50
Grate bars	9 00 to 9 50
Pipes and flues	11 00 to 12 00
Tank iron	10 00 to 10 50
Hoop and band iron	8 00 to 9 00
Sheet iron	6 50 to 7 50
Wrought drillings	10 00 to 11 00
Stove plate	10 00 to 11 00
Cast borings	7 25 to 7 50

CINCINNATI.

Nov. 29.

The coke market continues firm with quotations on furnace coke ranging from $2 to $2.10 and on foundry coke from $2.50 to $2.75 Connellsville.

Pig Iron.—The activity in the market the past week while not equaling that of a month ago is in contrast with the quietness noted a week ago. Among the large transactions reported were 12,000 tons to a large consumer in Pittsburg of which about 3,000 or 4,000 tons was Southern iron and the balance Northern iron. An Ohio concern is reported to have purchased about 2,500 tons of Southern and 6,500 tons of Northern iron. A Michigan melter bought 1,000 tons of Southern iron. Cast iron pipe makers have been conspicuous in buying and the leading interest in this line is reported to have taken 15,000 tons in the last ten days. About half of this quantity was sold in the week under review. There has been also a good general demand, with a number of the larger consumers in the market. An inquiry for 2,000 tons for an Indiana concern is still pending with delivery wanted in the second quarter. Prices have not advanced under the buying but a strong tone prevails and some of the furnace interests are declining to take business at ruling inside prices. The bulk of the tonnage of Southern iron is reported to have been sold at $13 Birmingham for No. 2 foundry, while the Northern iron went at $15 furnace, and $15.50 is now generally quoted by the latter. As the week closes there is increasing tendency toward firmer holding of both Southern and Northern iron. Production in the south does not increase materially and the coke supply, railroad situation, and labor troubles are still retarding factors in increasing of active furnace capacity. Current quotations f. o. b. Cincinnati are as follows:

Southern Foundry No. 1	$16 25 to 16 75
Southern Foundry No. 2	15 75 to 16 25
Southern Foundry No. 3	15 25 to 15 75
Southern Foundry No. 4	15 00 to 15 25
Southern Foundry No. 1, soft	16 25 to 16 75
Southern Foundry No. 2, soft	15 75 to 16 25
Gray forge	14 75 to 15 00
Northern Foundry No. 1	16 65 to 17 15
Northern Foundry No. 2	16 15 to 16 65
Southern Charcoal	18 75 to 19 00

Finished Material.—The market has been active and firm the past week. Bar iron has advanced again and is in good demand. There is no change in the other lines. All reports are augmenting business and there is a strong undertone to the situation generally. Bar iron is now quoted at 1.60c; steel bars at 1.43c, half extras, with dealers quoting 1.75c for iron and steel out of store. Galvanized sheets at 75 and 10 and 5 percent off. We quote black sheets, No. 27, at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.20c; No. 14, 2.10c; No. 12, 2.05c; No. 10, 2c. Tank plates are dull and sell out of store at 1.85c for ¼-in. and 1.95c for 3-16-in. No. 8 and No. 10. Beams and channels are quoted at 1.85c from stock, and angles at 1.85c to 1.90c for base sizes.

In merchant pipe there is no quotable change, but more active demand is reported. There is beginning to be some trouble in getting mill orders forward owing to railroad congestion. Independent mills are not underselling the schedule to as disturbing an extent as in the recent past. Car lots are quoted as follows f. o. b. Cincinnati.

MERCHANT PIPE.
(Basing Discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛ and ¼ inches	67.35	51.35	65.35	49.35
⅜ and ½ inches	71.35	59.35	69.35	57.35
¾ to 6 inches	75.35	65.35	73.35	63.35
7 to 12 inches	70.35	55.35	68.35	53.35

Old Material.—The market is still active with everything in this line firmly held and difficult to purchase. Quotations f. o. b. Cincinnati are now made as follows:

Old No. 1 railroad wrought, net tons	$14 50 to 15 00
Cast machine and foundry, net tons	12 50 to 13 00
Old iron rails, gross tons	18 00 to 18 50
Old steel rails, gross tons	13 50 to 14 00
Old short lengths, gross tons	13 50 to 14 00
Old iron axles, net tons	17 50 to 18 00
Stove plate, net tons	9 50 to 10 00
Wrought turnings, net tons	10 00 to 10 50
Cast borings, net tons	6 50 to 7 00

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Nov. 29.

Pig Iron.—Although the market during the past week was not as active as for the week's previous, prices of Northern irons are from 25 to 50 cents higher than they were this time a week ago. Northern No. 2 foundry is selling at $16 at Eastern Pennsylvania furnaces, but the tonnage represented has not been large. Southern brands are rarely heard of in this market nowadays, so far as sales are concerned. Southern No. 2 foundry is quoted at $13 to $13.50 Birmingham, with the latter figure the generally quoted one. Sales made in the past week were for the most part for delivery in the first quarter of the new year. Buyers do not care to contract beyond this period, although some sales have extended to the second half. Published reports that some buyers have bought for the third quarter are not credited here. There is little buying for immediate delivery, most consumers evidently having made provision for their requirements well into the end of the first quarter during the upward movement that prevailed recently. Northern makers are now underselling Southern interests from 50 cents to $1 per ton. This is the chief reason why Southern furnaces are not doing any business in this market. As for the market in general, the opinion seems to be that present prices will probably hold until the remainder of the year, but that in the meantime a quiet situation is likely to prevail. New York quotations at tidewater follow: Northern No. 1 foundry, $17.00 to $17.25; No. 2 foundry, $16.50 to $16.75; No. 2 plain, $16.25 to $16.50; Southern No. 1 foundry, $17.50 to $17.75; No. 2 foundry, $17.00 to $17.25; No. 3 foundry, $16.50 to $16.75; No. 4 foundry, $16.00 to $16.25.

Rails.—Trade is at a standstill pending the meeting of the pool to fix the price for 1905. There are reports of large sales having been made with the proviso that the pool price for next year be paid, some estimates placing the amount at from 500,000 to 600,000 tons. There are reports that the Lackawanna company is satisfied with its proposed allotment.

Finished Iron and Steel.—Trade in structural shapes

continues good, and the tonnage placed during the week has been excellent, being mostly confined to small lots. There are some important contracts pending, and announcements of their closing can be expected at any time. New business in plates is still of gratifying proportions, with the outlook good also Bars are being freely contracted for, and the tonnage booked during the week has been liberal. The demand for sheets shows no falling off, and prices are firmly held. New York prices at tidewater follow: Angles, 3 to 6 in. x ¼ in. and heavier, 1.54½c; beams, 3 to 15 in., 1.54½c; channels, 3 to 15 in., 1.54½c; beams, 18, 20 and 24 in., 1.64½c; tees, 3 x ¼ in. and heavier, 1.59¼c; plates, carloads, tank, 1.54½c; flange, 1.64½c; marine and ordinary fire box, 1.74½c; refined iron bars, 1.54½c; soft steel bars, 1.44½c; sheets, in carload lots, New York, No. 28, black, 2.40 to 2.45c; galvanized, 3.40 to 3.50c.

Contracts for bridge work just taken by the American Bridge Co. include 2,500 tons for Louisville & Nashville, 1,500 for the Buffalo & Susquehanna and 500 tons for the Lake Shore.

Old Material.—The week has witnessed a further strengthening in prices, but with few sales having been made, due to holders declining to meet the wishes of buyers. Accurate quotations are now harder to get than in months. The belief that values will go higher is to be met with on all sides. There is active inquiry for everything on the list, especially for heavy steel scrap, old rails and wrought scrap. We quote, f. o. b. cars:

Old iron rails	$16 00 to 17 00
Old steel rails, long lengths	14 50 to 15 00
Old steel rails, short pieces	14 00 to 14 50
Relaying rails	19 00 to 20 00
Old car wheels	13 50 to 14 50
Old iron car axles	19 00 to 20 00
Old steel car axles	16 00 to 17 00
Heavy melting steel scrap	14 00 to 15 00
No. 1 railroad wrought scrap	17 00 to 18 00
Iron track scrap	15 00 to 16 00
Wrought pipe	10 00 to 11 00
Ordinary light iron	10 00 to 11 00
Cast borings	6 00 to 7 00
Wrought turnings	8 50 to 9 50
No. 1 machinery cast	12 00 to 12 75
Stove plate	9 50 to 10 00

BIRMINGHAM.

BIRMINGHAM, Ala., Nov. 28.—The Alabama pig iron market is in a very strong condition, with prices generally firm at $13.50 per ton for No. 2 foundry, and some of the furnace companies are looking for a still higher price in the near future. More than one company has already sold over 50 per cent of its possible make during the first three months of the coming year. The accumulated stock of iron in this section is dwindling rapidly. The production shows no improvement this week over last week. The Tennessee company has seven furnaces in operation, the five at Ensley manufacturing basic iron. The Sloss-Sheffield Steel & Iron Co. has six furnaces going with a seventh one almost ready for the torch.

The strike of the union coal miners is still on, but non-union men are being brought in every week. The Tennessee Coal, Iron & Railroad Co. in the past week brought in between 200 and 300 men from Kentucky, East Tennessee and West Virginia. The leaders of the union miners assert that they have funds yet in hand or in sight which will assist them in the struggle for some time to come.

There are prospects of an early reorganization of the Jenifer Furnace Co., the litigation getting into such shape that the trustee or receiver may carry out such a plan.

The following pig iron quotations are made: No. 1 foundry, $14; No. 2 foundry $13.50; No. 3 foundry, $12.75 to $13; No. 4 foundry, $12 to $12.50; gray forge, $11.50 to $12; No. 1 soft, $14; No. 2 soft, $13.50. Indications, producers say, point to an early advance to $14 per ton for No. 2 foundry. The larger companies are not loading up on orders, anticipating the establishment of the new price for second quarter's business.

The American Rolling Mill Corporation, 802 Monadnock block, Chicago, is making some repairs at its bar iron mill in Muncie, Ind., with a view to starting it up in the near future. This mill has been shut down for the last eight months.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., Nov. 29.

Pig Tin.—The market during the past week has been exceptionally strong, due to favorable developments abroad. Prices have advanced nearly 1 cent per pound over those which prevailed a week ago. The London situation has been particularly strong and prices today are over £4 higher than our last quotations. Closing prices today follow: Spot and November, 29¾c to 30¼c; December, 29½c to 30c. London's closings today follow: Spot, £136 15s; futures, £136. Arrivals at Atlantic ports for the month to date aggregate 1,795 tons, with 2,120 tons afloat.

Copper.—For the first time in many weeks we must report prices unchanged. There are evidences that the recent manipulation of prices has spent its force, and no further advances are expected, while some think a reaction likely. The London market for the week has been fairly strong, with a slight advance in prices. Today's closings follow: Lake, 14⅞c to 15⅛c; electrolytic, 14¾c to 15c; casting, 14½c to 14¾c. London's closings today follow: Spot, £67; futures, £67 10s. Exports for the month to date aggregate 15,174 tons.

Lead.—Is quiet with spot practically unchanged at 4.60 to 4.70c. St. Louis is weaker at 4.35c to 4.40c. London declined to £12 18s 9d.

Spelter.—Demand continues good, with prices unchanged at 5¾c to 5⅞c for spot. St. Louis slightly higher at 5.55c. London is weaker at £25 2s 6d.

Antimony.—All grades are firm, Cookson's selling at 9.50c to 10c; Hallet's, 9.25c to 9.75c; and other grades, 8.25c to 9.25c.

Quicksilver.—We quote $40 per flask of 76½ lb. in lots of 100 flasks. London is £7 15s.

Nickel.—Sales are made at 40c to 47c for large lots down to a ton, and at 50c to 60c for small quantities.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, Nov. 29.

There has been a fair demand for metals in this market, and prices of pig tin, sheet zinc, pig lead and spelter are all up. The advances in copper noted last week have been well sustained, and buying at the new prices is of good proportions. We quote as follows: Lake copper, in carloads, 15¼c; in less than carload lots, 15½c to 15¾c; casting copper, 15⅛c for carloads, and 15½c for smaller lots. Pig tin, carloads, 30¾c; lesser quantities, 31¼c to 31½c. Sheet zinc, 6.75c for carload lots of 600 lb. casks, and 7¼c to 7⅝c for less than carload lots. Pig lead has been advanced to 4.60c for 50-ton lots, 4.75c for carload lots, and 4.85c for smaller quantities. Spelter is firm at 5¾c for carload lots, and 6c for lesser amounts.

There is a brisk demand for old metals, and prices are firmly held by dealers. We quote as follows: Copper wire and heavy, 12¾c; copper bottoms, 11½c; copper clips, 12¼c; red brass, 11½c; red brass borings, 19½c; yellow brass, heavy, 8½c; yeliow brass borings, 7¾c; light brass, 6½c; teal lead, 4¼c; zinc, 4c.

The Keystone Rolling Mill on Second avenue, Pittsburg, built in 1865 and owned by John L. and Thomas G. McCutcheon, will shortly be dismantled. The plant has been idle for nearly two years and was last operated by Joshua Rhodes & Co. under lease. The machinery was sold for scrap last week and the mill is to be immediately dismantled. The price paid for the machinery is reported at $25,000. The plant contained 36 puddling furnaces, 7 heating furnaces, two trains of muck rolls and one 9, one 18 and one 23-in. plate mill. The annual capacity was 36,000 tons of finished material.

A NEW VERTICAL ENGINE.

A small vertical engine recently placed upon the market has noteworthy features. Fig. 1 shows that the engine has graceful lines and is fully enclosed, yet the working parts are easily accessible by turning a milled hand nut and lifting out each plate. The special feature is the oiling system. Automatic lubrication of engines up to the present time has been confined almost entirely to the splash system. Large horizontal engines are less likely to prove annoying through defective lubrication under this system than are the small, high-speed, vertical engines.

The system embodied in this engine is different from any of the usual methods, and has proved very successful. Every frictional surface is running on oil, there being no positive contact between metals.

The oiling is automatic and instead of a drop or two a

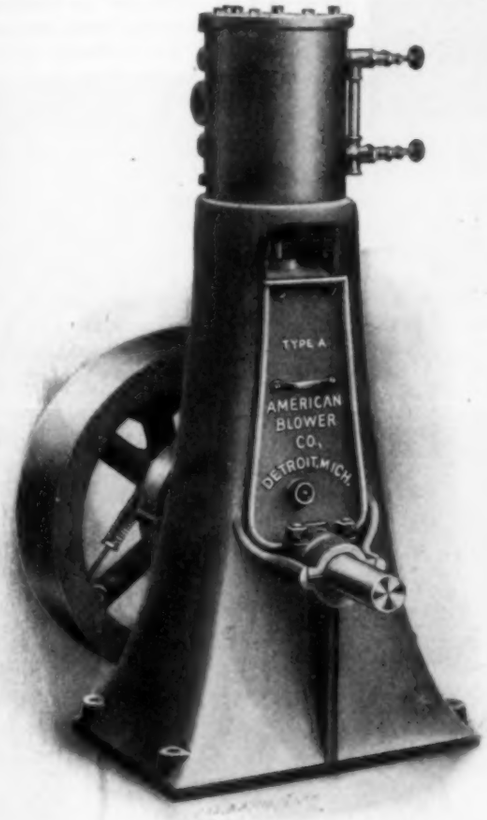


FIG. 1.—A NEW VERTICAL ENGINE.

minute each bearing has a stream of oil. By referring to Fig. 2 the operation can be easily traced. An eccentric K on the shaft actuates the plunger L of the oil pump A, forcing the oil up through the tube B into the small strainer C. From C it drops into an oil box through the bottom of which four tubes project. In one side of each tube is a slot, so that when the oil box contains only a small amount of oil, each tube can take its proper proportion. In case the box is full all the tubes get more oil in proportion to the increased height.

Two of these tubes F and C, and two on the opposite side, apply oil to the guides, the oil dropping into a small oil trough G from which it runs into the bearing through a small oil hole. The crosshead pin is supplied by the tube marked E, the oil drops into the cup H and fills the cavity between the bolt and inside of crosshead pin and the oil grooves. The oil dropping from the crosshead is caught in two pans attached to the inside of the covers. From these oil pans it runs down the inside of the cover dropping into a cup in the top of the main bearing cap. Instead of oil grooves at the top and bottom of the main bearing, as ordinarily made, in this system, the bearing is cut away at the joint. When the strain from the connecting rod is upward, the oil is carried to the bottom of the bearing but when the load is reversed, there are no oil grooves to carry away this oil. The crank pin is oiled through the tube marked D. This tube discharges into a crank oil ring inside the eccentric K which in turn discharges into the crank pin oil tube, and flows across the crank pin bearing. The crank pin oil ring in addition to its independent supply catches the drip from one end of the main bearing. The eccentric is oiled by the drip which it catches from the other end. No difficulty has been experienced in catching the oil thrown off the eccentric strap and the splash from the crosshead has been equally easy to manage, the outside of the engine being free from oil. A portion of the oil as it drops back into the bottom of the frame falls upon an oil filter thor-

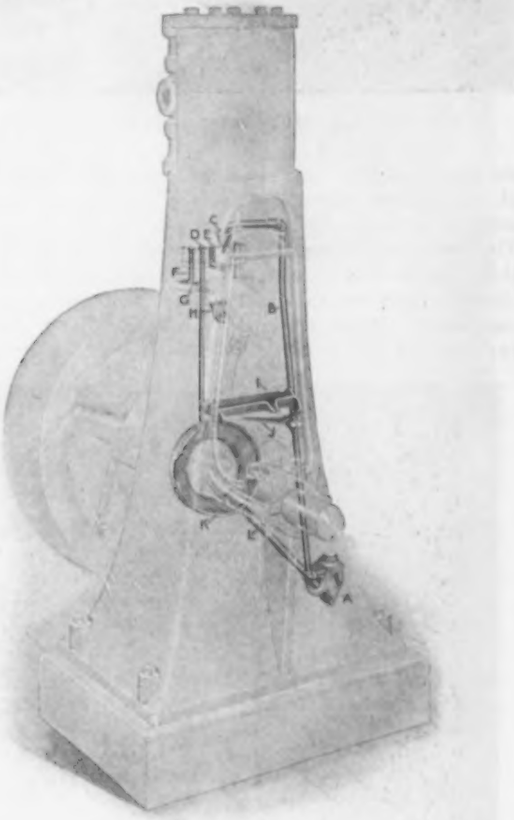


FIG. 2.—LUBRICATING SYSTEM OF A NEW ENGINE.

oughly cleaned and purified. The large base gives the oil an excellent opportunity to cool and settle.

In its own shops the manufacturer has been experimenting with this engine for some two years past, and in connection with the experiments an engine was adjusted and filled with oil on March 10. Up to July 15 no adjustments had been made, and no oil added except to fill the sight-feed cylinder lubricator. The engines has been operating from 14 to 16 hours a day driving a blower, and after the lapse of over four months needs neither adjustment nor fresh lubricant, running almost as noiselessly as at the start. The particular application of this engine is where continuous operation is required or peculiarly heavy duty imposed, as in driving blowers, dynamos, pumps, etc. It is built by the American Blower Co., of Detroit.

The Railway Steel Spring Co., has declared the regular quarterly dividend of 1¾ percent on its preferred stock, payable Dec. 20.

Miller & Co.'s Works at Edinburg, Scotland.

BY E. GUARINI.

To give some general account of these works and of the process of chilled wheel manufacture there carried on is the object of the present article. We shall first give an outline of the works and then turn attention in particular to the process of manufacture. The buildings and yards cover over three acres of ground, and have a long frontage of hewn stone. The lower part of the buildings shown is the south turning shop, the building running east and west, while the higher elevation represents the general offices with workmen's dwelings above. At the east end is an entrance gate where the pay box and gate house are situated. Ample facilities exist for obtaining and distributing materials, as there is a switch leading into the works from an adjoining branch of the North British railway. The siding is served by the firm's own locomotive and coke and iron cars. Near this siding is a warehouse 200 ft. long, where all finished articles are assembled and made ready for shipment. Three stories are available in the warehouse, as there are two galleries above the ground floor served by electric and hydraulic hoists. In addition to wheels, the works produce a considerable variety of articles in chilled iron. An important branch of the work is the production of chilled iron rolls for paper mills, seed crushing mills, India rubber works, and flour mills. The rolls are cast vertically in the roll foundry, massive iron molds being used, so that the chill may reach a good depth in the casting. Powerful lathes are employed for turning and finishing. Next after the roll depatrment comes the general foundry. Besides the rolls, general and large wheel shops, there are four machine shops, a smith's shop, and a steam and hydraulic-power plant.

FIG. 1.—MAIN OFFICES, ENTRANCE TO WORKS AND TIMEKEEPER'S OFFICE.

The steam plant consists of three B. & W. boilers. The steam raised is used for a 150 h. p. engine which drives the main shafting in the shops, and six auxiliary engines, operating cranes, hoists, blowers for the cupola, etc. The hydraulic plant supplies power to 12 traveling cranes and to several jib cranes. Eight electric motors are also employed for driving parts of the machinery and some cranes. Electric light is also employed throughout the works.

Coming now to the wheel making department, it may be stated that the cupolas are situated outside the wall of the foundry, and the full trucks are lifted by a hoist to the charging platform. The molten iron is conducted into large receiver ladles inside the foundry, the short runner passing through the wall. When a ladle is filled a sample is taken from it, cast, cooled, and tested, to demonstrate that the metal is of correct chemical composition. This is done every time a receiver ladle is filled. The casting ladles are run along on a narrow gauge railway track in front of the receivers. When filled they are picked up by overhead cranes and carried to the molds. The mixture for the latter consists mainly of Erith sand. At the part where the tread of the wheel is to be formed is a thick iron ring, which forms the chill. The entire wheel is

FIG. 2.—A PART OF THE FOUNDRY.

thus formed in contact with the non-conducting sand mold, with the exception of the periphery. There the molten metal comes in contact with the cold iron mold or chill, and the chill in the tread and flange, of extreme hardness, is at once produced. The central part of the wheel retains its softness and toughness, so that it can be readily bored to fit the axle, and can also withstand the shocks of regular service on the road.

While the wheels, after casting, are still at a bright red heat they are taken from the molds and transferred by traveling cranes to annealing pits, in which they are slowly cooled off. The pits are lined with firebrick and as soon as a pit is filled with red hot wheels it is closed and sealed at the top. The wheels remain in the pits for several days and the gradual cooling prevents undue shrinkage strains. The wheels are next taken to the adjoining snagging, or as it is there called the fettling shop, where they are placed in specially designed tumbling barrels. These are revolved by belting at high speed, and the sand adhering to the wheels is shaken off. Subsequently the surface of the wheels is dressed by hand. They then pass into the warehouse adjoining, where they are submitted to close examination and are tested mechanically. One out of a certain number is tested to destruction by a falling weight. Wheels which are supplied loose are bored and ground in this warehouse; those which are to be fitted to axles are passed into the regular machine shops. There are five self-acting wheel-boring machines of the same type and some of these bore for the axles and face the hubs at the same time. Two grinding machines are specially designed for grinding wheels either on or off their axles.

The wheels are pressed on their axles by hydraulic presses capable of exerting pressure varying from 70 to 250 tons. The axles are made from mild steel bars or forgings. The wheels are of various types, including spoked, disc single and double plate. Besides the tramway wheels, the firm manufactures heavy chilled iron wheels for railway work, and the new plant which has recently come into full operation is capable of dealing with a large output in this direction. The other products of the firm are brake blocks of chilled, partly chilled, or soft sand molded iron, and chilled iron crossings for electric railroad tracks.

The chemical laboratory has chemical analyses made not only of raw material brought in, but of each day's product. Records are kept of these analyses, and as every wheel turned out has cast on it identifying figures, etc., each individual wheel can be traced even after years. In case of complaint, all the circumstances can be looked up and all the conditions at the casting ascertained. The works can produce about 500 wheels per day, and taking all the departments together, they melt and work up about 300 tons of iron per week, and at present 400 men are employed.

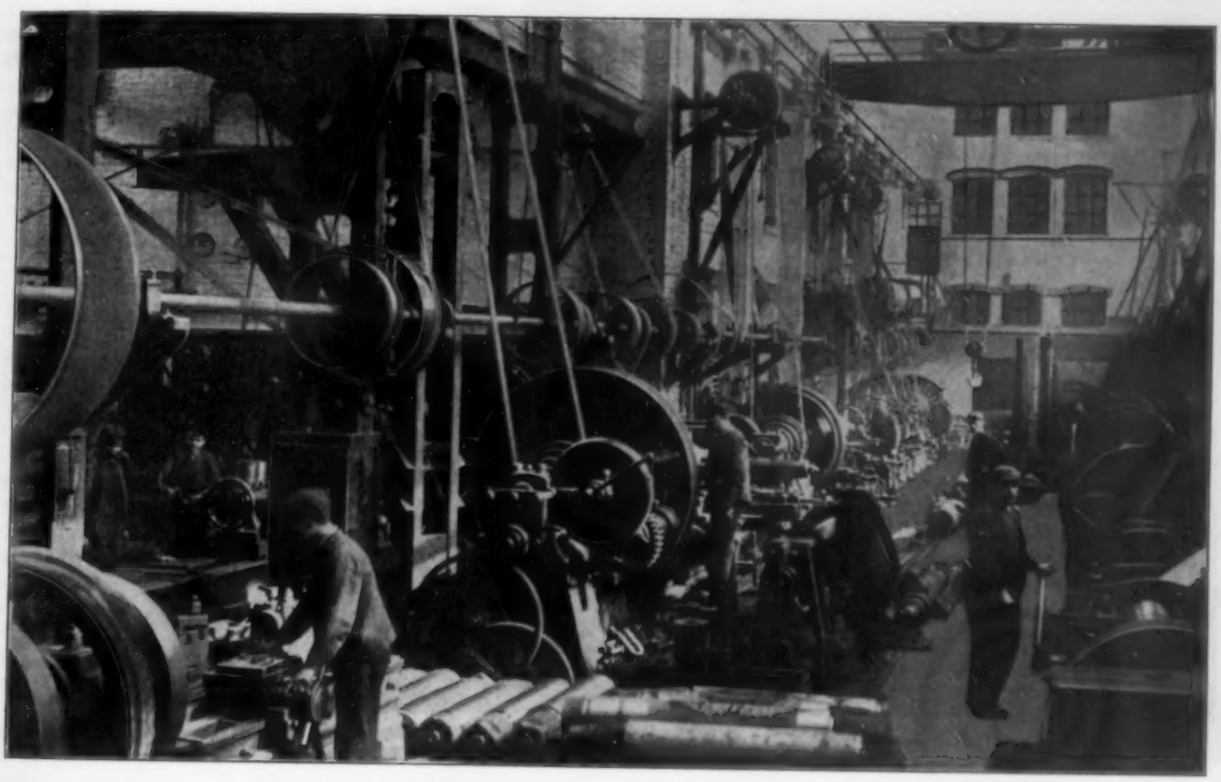


FIG. 3.—A VIEW OF THE SOUTH SHOP.

The Indiana Scale & Truck Co. has opened its general office in the Spitzer building, Toledo. The company manufactures the Parsell truck scale, a truck for conveying goods from store to wagon, the platform of which is so arranged that by throwing a small lever the truck is transformed into a scale. The plant is located at Bluffton, Ind., and has been closed for a number of months, owing to litigation among the former owners. The present company has completed negotiations whereby it becomes the owner of all the patents and factory rights, and has started the plant running full time. The officers of the company are: A. C. Johnson, president; Sam Snell, manager; H. Church, secretary and treasurer.

The Phœnix Iron Works Co., of Meadville, Pa., has received notice from St. Louis that the International Philippine jury of the exposition, as associated with the board of the exposition, under the presidency of Secretary of War Taft, has awarded the company a gold medal for the compound engine exhibited in the power plant of the Philippine Government board.

The Hoosier Jack & Combination Tool Co., Indianapolis, Ind., has been very busy making special machinery for its own use and getting its plant ready for operation. The company expects to be in the field by the first of the year with a full line of automobile jacks, stone lifting jacks and jacks for stump pulling and railroad service.

The Hoisting Problem at Iron Mines.*

BY JAMES R. THOMPSON.

The hoisting problem is an ever present one with the miner. Perhaps I ought to say the underground miner, as our friends from the Mesabi open pits have not been seriously bothered by this problem as yet. Some of the open pits, however, will soon, if they have not already, reach the point where stationary engines will be found more economical than locomotives to handle their product. It is perhaps fair then to ignore the open pit miner as being only a temporary exception to the statement that the hoisting problem is one that always confronts the miner. The conditions of the problem vary with different districts, and indeed each individual mine seems to receive, even if it does not require, an independent treatment.

It is not strange then that the practical solution of the problem in the Lake Superior mining region should have produced an immense variety of hoisting machinery. Puffer hoists, oscillating, slide-valve and Corliss engines, first motion and second motion plants, hoisting in balance and out of balance, single drum and multiple drum, hand handled, power handled, and if so, what are the requirements to which a modern hoisting plant should conform.

The solution of the hoisting problem is by no means simple, but has several phases, of which three are the most important. They are closely related and no one of them can be settled independently of the other two. These phases are: the problem in relation to the underground requirements, its engineering and mechanical features, and lastly the financial end of the problem, which usually dictates the final decision. It is our purpose to discuss these three phases in the order given.

Underground Requirements.

The directly productive work of a mine is that going on underground, and every other mine activity must be so arranged that the underground work may proceed most efficiently. It is fundamental, then, that the underground force should not be obliged to wait upon the hoist, but rather must the hoist be the servant of underground requirements, always ready for service when called upon. From the underground standpoint, then, the speed of hoisting is of the first importance.

Hoisting practice on Lake Superior largely, but perhaps unconsciously, conforms to a certain standard of speed. There

FIG. 4.—THE LABORATORY.

plants built for 150 ft. depth, plants built for 5,000 ft. depth, plants forced to work far beyond their capacity and constantly on the verge of breakdown, plants installed to discount a magnificent future, working at a mere fraction of their capacity, plants built regardless of steam economy, plants for the extremest economy of steam consumption, regardless of first cost—all these and more are easily found.

It is a difficult matter for any one to select those plants which are best fitted for the work they have to perform and the general conditions they have to meet. Opinions will necessarily differ as to which are best, and yet it seems that the experience of more than 50 years in one of the greatest mining regions of the world should have brought settled ideas as to some of the phases of the general problem. In view of the great diversity of hoisting machinery it is pertinent to ask whether there are any well settled fundamental principles governing the choice of a hoisting plant for any conditions,

*Read at the meeting of the Lake Superior Mining Institute, August, 1904. Mr. Thompson is general manager of the Newport Mining Co., Ironwood, Mich.

are important exceptions, both faster and slower, but plants which nearly conform to the standard practice have the reputation usually of being successful plants. This speed standard may be stated as follows: That, no matter what the depth, the load must be hoisted from the bottom of the mine within one minute, and the round trip take only from two and one-half to three minutes. This seems on first statement to be an exceedingly arbitrary standard, but the fact is that the second motion hoists installed at the iron mines of from 300 to 800 ft. depth have roughly conformed to it, no less than the big Nordberg quadruple engine hoist at Tamarack, with drum 25½ ft. in diameter, hoisting from approximately 5,000 ft. and making from 18 to 20 trips per hour. A duplicate of this hoist is now being installed, which certainly indcates that the first one has satisfied the requirements of their underground work. Practice at the Quincy, unless recently changed, is the same. It is on record that a hoist at the De Beers mine at Kimberly has hoisted 46 round trips in one hour, per single skip, and has maintained an average of 32 round trips per hour for 24 hours from a depth of 1,260 ft. The record is qualified, however, by the statement that this stunt was done for record-making

purposes and not to meet regular requirements, which were much less. A first motion hoist with 12-ft. drums, installed some 15 years ago at an iron mine about 500 ft. deep, could, undoubtedly, if it did not actually, exceed that record. That such a speed of hoisting is unnecessary and excessive is indicated by the fact that a plant recently installed at the same iron mine to meet the same conditions has drums but 6 ft. in diameter instead of 12 ft. Coal mines, which usually screen their coal at the top of the shaft, are apt to drain a large territory to one shaft, and with lighter loads hoist more rapidly, often reaching the rate of a round trip per minute from a depth of 500 or 600 ft. It might be expected that the large iron mines, especially as they gain depth, would reduce the number of operating shafts and require a more rapid rate of hoisting. Observation of the shafts projected, however, and hoisting facilities planned leads to the conclusion that the rate of hoisting as stated will satisfactorily handle the required production for an indefinite time to come.

The loads hoisted have varied from one ton in the early days of shallow mines to a maximum of five tons in the iron mines and of 7½ tons in the copper district. It has evidently been found wise to increase the product by increasing the load hoisted rather than to increase the rate of hoisting. It may be stated, then, as a result of Lake Superior experience that in general the underground requirements of a hoist are that it must hoist its load in a minute and make a round trip in three minutes, no matter what the load or depth of the mine.

Mechanical Features.

In considering the engineering and mechanical phase of the problem many questions arise which must be decided in conformity with the two fundamental principles of engineering design, viz., the plant must be capable of doing the work and without breaking down and it must be built and operated at the lowest possible cost.

A consideration of the mechanical details of construction necessary to secure the proper capacity and strength of plant, does not come within the scope of this paper, which will be confined to questions of general design and to the application of the second engineering principle stated above. This principle, in other words, is that the plant must be designed both for economy in first cost and for economy in operation. When these two conflict, the financial aspects of the question will dictate the proper compromise.

The first element to be considered is that of power. Late practice uses about 150 lb. steam pressure. This is somewhere near the limit at which ordinary standard pipe and fittings and ordinary workmanship are satisfactory. This pressure, moreover, as compared with 100 lb., until recently the maximum carried, gives a 50 percent increase of power with less than 5 percent increase of coal consumption. Such increased power means much smaller engines and hence a lighter construction throughout, a distinct advantage in first cost of plant. To derive such a large increase of power with so small an added expenditure for fuel means an increased economy of operation which can perhaps be duplicated in no other manner. There is then every reason in favor of designing an up-to-date hoisting equipment for the use of 150 lb. steam pressure. In a recent case the saving in first cost possible by designing the plant for 150 lb. steam instead of 100 lb. was sufficient to have installed a new boiler plant complete, designed for the higher pressure, to say nothing of the further economy of operation after the higher pressure equipment was installed.

In ordinary power plants the means of arriving at ultimate economy are well understood and commonly practiced. Where considerable steady power is required the advisability of installing compound condensing or triple expansion condensing engines is unquestioned. The duty required of a hoisting plant, however, is very peculiar and the ordinary treatment does not necessarily fit the case. The load upon a hoisting engine consists of the weight of the ore, which is the total live load, the weight of the cage and car or skip holding the ore, which is a constant unvarying dead load, and the weight of the rope, an important percentage of the whole, which is a dead load constantly varying in amount, being greatest at the beginning of the hoisting trip and nothing at the end. Added to this variable and largely unprofitable loading of the engines is the extremely intermittent character of the service required. The engines must start the maximum load, attain full speed in six or seven revolutions, hoist a constantly decreasing load to the surface and stop short, all within one minute, and after a longer or shorter period of idleness must repeat the operation. Under such conditions of operation the ordinary methods of attaining economy of operation in steam

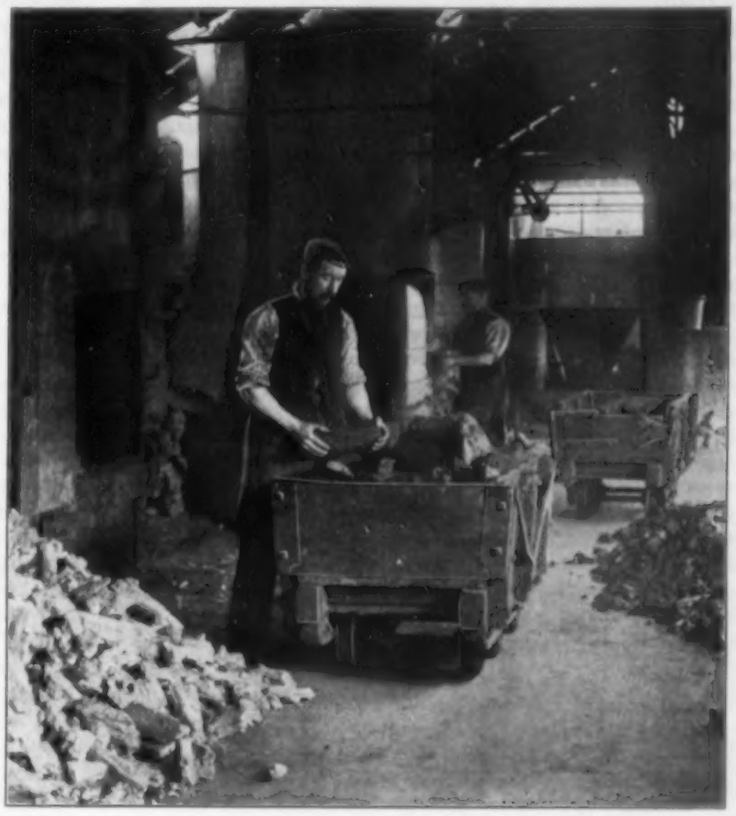


FIG. 5.—THE CHARGING FLOOR.

engine practice are insufficient if not positively worthless. Lake Superior hoisting experience has fully demonstrated that a simple Corliss engine or other engine of automatic variable cut-off gives more economical results than a slide valve or fixed cut-off engine, and such engines have usually been adopted for hoisting plants of any considerable size. The results of the attempt to gain a still greater economy of operation by the use of compound or triple expansion engines are somewhat indefinite, not to say negative. The subject is one of considerable practical difficulty for the reason that no one knows definitely what steam is required by the various types of engines in actual hoisting service. Even the compound and triple engines must use steam non-expansively to start and rapidly accelerate the load; and as different plants and indeed the same plant at different times are handling loads which vary greatly in the proportion between the live and dead loads, it is impossible to estimate the steam consumption in the ordinary method. The boiler plant supplying

steam for hoisting usually also supplies steam for pumping, air compressing and other purposes which renders it impossible to determine directly just the amount of coal to be charged to the hoisting. Even if this could be done two plants are almost never sufficiently similar in working conditions to render an accurate and reliable comparison possible.

The mining fraternity would certainly welcome a definite demonstration that under actual working conditions in our mines the use of compound or triple expansion engines would give a real economy. Failing such an accurate basis of knowledge we can only say that the impression seems to prevail, confirmed by the major part of the best hoisting practice, that it is useless to endeavor to reach a greater economy of steam consumption in hoisting plants than is reached by the simple Corliss engine. A cross compound condensing hoist was installed some years ago at the Lake shaft of the Cleveland-Cliffs Co. A recent installation at the same mine is of the simple Corliss type. The Calumet and Hecla mine has apparently aimed at the extreme limit of steam economy in its hoisting practice, while the Quincy and Tamarack, not to mention many others, are continually installing hoists with simple Corliss engines. The beautiful C. and H. hoists, elegant in workmanship and finish as they are, have no general reputation of phenomenal economy of steam consumption. If they really have proved unusually economical in hoisting service, it would seem that some, at least, of their neighbors operating under similar conditions would have abandoned the simple Corliss engines for a more efficient type.

It is generally recognized that increased speed of an engine means increased power. Lake Superior hoisting practice, however, has generally if not entirely proceeded on the idea that increased capacity was to be gained only by an increase in the size of the drums, ignoring the advantage that might be obtained by increasing engine speeds. Its practice in that respect is somewhat behind present day engine design in other lines. The increase of engine speed would tend to lessen the size of the whole plant as well as of the engines required, and I think it safe to predict that in the future development of hoisting practice engines of higher rotative speeds will be used and this important method of gaining increased capacity, moderate weight and first cost of plant will not much longer be overlooked.

Balanced and Unbalanced Hoists.

Owing to the nature of the load on hoisting engines many plans have been used both for equalizing the variable weight of the rope and for so combining two single hoists that the dead weight of one load would counterbalance the dead weight of the other. The advantages of these various plans have recently been presented by an eminent mechanical engineer in an article published in *Mines and Minerals*. It is not necessary to cover the same ground in this paper but it is desired to discuss one important phase of the matter which seems to have escaped the attention it deserves. A typical hoisting problem, taken as an illustration, will perhaps aid in clearly presenting the idea and the conditions assumed in the article referred to, and stated to represent fairly a large mine in the West, and which also represents the problem as frequently met in the Lake Superior country, will very well serve the purpose. The article assumes a vertical shaft 2,000 ft. deep, from which it is desired to hoist two cars each holding 2,000 lb. of ore on a double deck cage. The load will then be made up as follows:

	Load, pounds.	Per cent at bottom.	Per cent at top.	Average per cent.
Weight of ore	4,000	32	47	39½
Weight of two cars, cage and rope from sheave to cage	4,500	36	53	44½
Weight 2,000 ft. 1⅛-in. round rope	4,000	32	00	16
Total load at bottom	12,500	100		
Total load at top	8,500		100	100

It appears then that the net load of ore is only 32 percent of the total load at the bottom, and 47 percent of the load at the top, an average of 39½ percent. This means that with an unbalanced hoist 60 percent of the total work done is dead work and only 40 percent of the total work is efficient. In other words the engines must do two and one-half times as much work as would be needed if no part of the load were dead weight or if all the dead weight were counterbalanced. If an ordinary balanced hoist is used in which the cages are balanced while the rope remains unbalanced the net load will average 66 2-3 percent of the entire load as compared with 40 percent average net load with an unbalanced hoist. In an ordinary balanced hoist the skips balance each other and the average weight of the ascending rope is equalled by the average weight of the descending rope, so that theoretically the load on the engines is due only to the net weight of the ore. In starting, however, the load on the engines is much greater, being the entire weight of one rope added to the net weight of the ore. Considerably larger engines are therefore required to start the load than would be needed if a perfect balance of the rope weight existed at all times. At the end of the trip the load is due to the net weight of ore diminished by the entire weight of one rope, a condition in which the large engines necessarily used to start the load are excessively underloaded.

With this style of hoist the load always varies by an amount equal to the entire weight of both ropes, or twice the amount of variation which occurs in hoisting an unbalanced load. It is of course impossible to determine how much the advantage of the theoretical balancing of the ropes is greater than the disadvantage due to the use of larger engines and to the very irregular distribution of the load. The tables given, referring to the balanced hoist, were therefore based on the assumption (more or less inaccurate, according to circumstances) that the advantages and disadvantages exactly offset one another and that the work done by the engines of a balanced hoist is that due to hoisting the average weight of one rope added to the net weight of ore.

Under these conditions a proper design for hoisting in balance is very important, but the question arises whether the most important direction in which economy can be obtained does not lie in reducing the proportion between the dead load and the live or net load. If the dead load could be entirely avoided the problem of securing an economical hoist would be reduced to that of securing simply the best engines for the purpose. The nearer this result can be reached the more important becomes the engine and the less important the balancing features of the design. This is an important feature because conditions are always such that a balanced hoist can be used.

Let us assume the same depth of shaft but change the load to one of five tons and hoist it in a skip. We can then make up the load as follows:

	Load, pounds.	Per cent at bottom.	Per cent at top.	Average per cent.
Ore	10,000	57	74	65½
Skip and rope from sheave to bail	3,500	20	26	23
2,000 ft. 1⅛-in. plow steel rope	4,000	23	00	11½
Total load at bottom	17,500	100		
Total load at top	13,500		100	100

The net load of ore, then, is 57 percent of the maximum load in place of 32 percent and 76 percent of the minimum load instead of 47 percent, averaging 65½ percent. This means that with an unbalanced hoist only one-third of the total work done instead of 60 percent is dead work and that two-thirds instead of 40 percent of the total is efficient. Stated differently, the engines do only one and one-half times instead of two and one-half times the work necessary if none of the load lifted was dead load. Furthermore, an unbalanced hoist under this assumption is practically as efficient as the balanced hoist

under the conditions first assumed. If now, we assume that this plant is made to work in balance in the ordinary way we find that 83 1-3 percent of the total work done is consumed by the live load, and only one-third of total work is used in lifting the dead load. In some cases it would be feasible to fully balance the dead load by attaching a balance rope to the bottoms of the skips extending from one skip to the other around a pulley located in the bottom of the shaft. With the addition of the balance rope the design of the hoist becomes theoretically perfect; that is, by this arrangement the entire effort of the engines would be utilized in lifting the weight of the ore and of the ore alone, the variable load on the engines would be overcome and the only difficulty in attaining economy of steam consumption would be due to the intermittent nature of the duty required. The balance rope has I believe been lately installed on the Whiting hoist at the Red Jacket shaft of the Calumet & Hecla mine. So far as known it is used nowhere else on Lake Superior. With the exception of the balance rope, the latest and best Lake Superior hoisting practice largely conforms to the typical hoist conditions assumed above with the heavy load.

A table presented herewith based on the live load as the unit for comparison perhaps shows the differences of the two assumptions in a more graphic manner.

FIRST ASSUMPTION.

		Bottom load, Per cent.	Top load, Per cent.	Average load, Per cent.	Ordinary balanced hoist, Per cent.	Full bal. hoist with bal. rope, Per cent.
Ore	4,000	100	100	100	100	100
Cage and car	4,500	112½	112½	112½	...	...
Rope	4,000	100	...	50	50	...
Total on engine	12,500	312½	212½	262½	150	100

SECOND ASSUMPTION.

Ore	10,000	100	100	100	100	100
Skip	3,500	35	35	35	...	...
Rope	4,000	40	...	20	20	...
Total on engine	17,500	175	135	155	120	100

If a reduction of dead load results in such economy as indicated by the figures given, the inquiry immediately arises whether the process may not be successfully applied a little further even to the plant itself. In Lake Superior practice increased hoisting capacity either for depth or product has very largely been obtained by increasing drum diameters, which has resulted in the common use of large diameter drums even for very moderate depth. It requires no inconsiderable power to start, accelerate, move rapidly and then stop suddenly a large and heavy mass of machinery. It certainly requires considerably less power to handle small machinery than it does to handle large. The question is, and a very live and important question on Lake Superior and wherever deep hoisting is done, is it possible to serve our mine satisfactorily with smaller and lighter drums, thus decreasing the size of engines needed and the size and weight as well as cost of the entire plant. If the facts are as stated in this paper, viz., that in general drum diameters alone have been increased to gain speed, and, as a general thing rotative engine speeds in hoisting practice have not kept pace with engine speeds in other practice, it is evident that improvement along the lines suggested should be possible. Consider again our assumed hoisting problem. The article already quoted specifies as necessary a straight drum 9 ft. 10½ in. in diameter, driven by engines 22 in. x 60 in., a good sized drum and a slow speed engine. On the same basis if the net load should be increased to 10,000 lb. as suggested, engines 32 x 60 in. would be required and the plant would probably weigh more than 225,000 lb. Suppose, however, we consider the results of using a drum only 6 ft. in diameter. With a steam pressure of 150 lb., 20 x 42-in. engines are ample to handle the load, and the whole plant would weigh approximately 105,000 lb. First class engine builders offer engines of that size guaranteeing satisfactory service and wear with a speed of 125 r. p. m. which would give a rope speed of 2,375 ft. per minute with a first motion hoist. Such a plant would then answer the underground requirements as it would hoist the load in less than one minute. The first cost would be low on account of its moderate weight, and the cost of operation would be low because of the economy of using a high steam pressure, and because the live load hoisted would be a maximum and the dead load including the machinery losses would be a minimum.

In hoisting in balance in a mine with many levels or of constantly increasing depth, it is usually desirable to use two drums which can be operated independently or in balance as desired. The very considerable width obtained by the usual construction, placing two small drums carrying so large an amount of rope, end to end, on one shaft, would cause the ropes to lead from the head sheaves on to the drums at an undesirable angle, unless the hoisting plant was situated a long way from the shaft. The question of rope lead, under some circumstances, such as often found in the western mountainous mining region where space is valuable, has undoubtedly led to the general adoption of the flat rope reel hoist, because the rope always leads in one line from the reel to the headsheave. Under ordinary circumstances where room is not so great a consideration, the width of a single 6-ft. drum, carrying 2,000 ft. of rope, say 11 ft., is not sufficient to cause an undesirable rope lead, with the hoist located reasonably near the shaft. Where two drums are necessary, the advantages of the small drum design, on the score of greater structural strength and low first cost of plant, are sufficient to warrant its adoption where possible. The difficulty of the rope lead is easily overcome by placing the two drums side by side, on parallel shafts, instead of end to end on a single shaft, driving them by side bars like the side rods of a locomotive. Second motion plants are often designed with two drums mounted on separate, parallel shafts, and the driving pulleys of Whiting hoists are operated with side rods as suggested. So far as the writer is aware, however, no first motion plant hoisting with drums has ever been constructed in this manner. The benefits of securing a satisfactory hoisting plant which would weigh much less, and cost much less for the plant itself as well as requiring much less expensive foundations and building, should abundantly justify an unusual construction and especially a construction to which there can be no mechanical objection.

Furthermore, the small straight drum design, driven by high speed engines, has all the advantages sought to be obtained by a conical drum design, viz., ability to start the load with engines of reasonable size and a sufficient rope speed for the hoisting capacity desired. The Whiting system of hoisting has recently been advocated by several eminent mining and mechanical engineers as very desirable for deep hoisting, on the ground that the balance rope or tail rope hanging from the bottoms of the cages rendered the load on the hoist uniform and enabled more economical engines to be used to advantage. The balance rope could be usd on an ordinary balanced hoist as well as on a Whiting hoist. Equally efficient engines could be used on the one as on the other. Considering the many turning sheaves used by the Whiting system the slippage of the rope on the driving pulleys and the cumbersome method of adjusting the hoist to varying conditions, it is difficult to think that it has any advantages over the ordinary type of balanced hoist with two drums which may be used independently or connected in balance as desired.

Financial Side of the Problem.

Some of the financial aspects of the hoisting problem have been indirectly considered in the foregoing as it is impossible to exclude the question of cost from comparative value. In

any given case in searching for the very best hoist, all things being considered, there is usually a choice of several hoists embodying many apparently desirable features. How shall our choice be guided in the best interest of the surplus account of the business from which dividends are paid, for, after all, this is the main question and includes all the others. In recent history on the Mesabi three properties with practically identical conditions purchased hoists. One paid $1,400 for its hoist and hoisted its required product, some 50,000 tons, the first season, the second paid $2,600 for its hoist and the third paid $4,600 for its hoist. Under their conditions the amounts were not vitally important perhaps, but in considering a larger plant the question of spending $14,000, or $26,000, or $46,000, for a hoisting plant is of great importance, and the choice of the higher priced plant should rest on stronger grounds than mere personal preference which undoubtedly controlled in the case of the small hoists. When should a hoist costing $26,000 be purchased instead of one costing $14,000, assuming that both would hoist the required amount of ore? The answer is evident. When the definite saving in the cost of operation of the expensive plant is sufficient during the time it is being used to pay the whole of its additional cost and a good rate of interest on the same. Otherwise the costly plant is a source of unnecessary expense. Many plants on Lake Superior have been installed too large for present needs with the idea of making them large enough for many years of added development. It is doubtless true in many instances that the interest charge on the extra cost of such plants during the years they were being operated below their economical capacity would more than pay the entire cost of the plants when plants of such capacity became really needed. The attempt to discount the future and make a single installation satisfy both present needs and possible future requirements may easily be overdone. A reasonable plan to follow is that a desire to discount the future must not be allowed to unfit the plant to meet the present known conditions in the most efficient and economical way.

Points in an Ideal Hoisting Plant.

From the standpoint of the purchaser then, whose point of view I have attempted to present, the following conclusions may be drawn as to the requirements to be met by an ideal modern hoisting plant.

It should use at least 150 lb. steam pressure, because of the smaller size and cost of engines to give the required power, and because of the fuel economy gained by using that pressure instead of lower pressure.

It should hoist the load from the bottom in one minute and make a round trip in less than three minutes, no matter what the load or depth of shaft.

The live load should be as large as possible in proportion to the dead load, and the mass of moving machinery should be kept as small as possible.

The most perfect plan of balancing feasible under the individual circumstances should be used.

A plain Corliss or other automatic, variable cutoff engine should be used since the majority of the best present practice indicates that no other engine will give greater economy in hoisting service.

It is desirable to use engines of as high rotative speed as is found practical in other lines of engine practice.

The drums used should be as small as possible for the required hoisting speed and capacity, when driven by high speed engines.

Straight drums should be used, as there is no advantage to be gained by special designs of cone drums, rope reel, or other hoisting systems, sometimes advocated, over straight drum designs with the drums made as small, as they may be made, by using engines of high rotative speed.

Hoisting Plant at Newport Mine.

In conclusion, it may be interesting to some of you to know that the ideas advanced here have been confirmed by some practical experience and that the principal features of the assumed plant are actually embodied in an existing hoist, designed by Howard Greer Jr., Chicago, and located at the K shaft of the Newport mine. The somewhat unusual features of this plant are my excuse for adding a short description of it to this paper.

K shaft has two hoisting compartments in its lower portion only. The mine had developed beyond the capacity of the old plant, without warranting the expense of stripping the balance of the shaft so as to have two hoisting compartments throughout its length. A first motion plant with a single drum, capable of hoisting a net load of five tons from a depth of 2,000 feet, was therefore decided upon but designed so that whenever the shaft should be stripped so as to allow hoisting in balance, a second drum could be added, on a second shaft parallel to the first, and driven by side rods from the driving discs of the first drum. The drums were intended to work either independently or clutched in balance as desired.

The engines and first drum were put in service last January. The drum is 6-ft. in diameter by 11 ft. long, built with three spiders entirely of steel except the drum shell, which is of cast iron. This construction not only makes a drum of light weight but one which is very rigid and well able to stand the shocks of service with so heavy a load. The engines are 20 x 42 in., using 150 lb. steam pressure and designed for a speed of 116 r. p. m., giving a rope speed of 2,200 feet. The engine frames are very rigid with seven holding down bolts all practically strengthening the fastenings of the main pillow block, and all other parts are designed of extra strength and very large factor of safety.

In our regular work hoisting four net tons from a depth of 1,500 feet with the rope speed reduced to 1,600 ft. per minute we have been able to hoist continuously over 900 tons per day, while the hoist was apparently working at about three-quarters of its capacity under those conditions. The plant weighed only 101,000 lb., and there are probably few if any plants in existence hoisting an unbalanced load so large in proportion to its own weight.

The old second motion plant hoisting a four ton load with a 6-ft. drum was satisfactorily handled by hand power, therefore we equipped the new plant with hand-handling gear to reduce the first cost. The new first motion plant, however, was so much quicker and more powerful in its action, as to render quick acting steam-handling gear are desirable, and when the plant is completed in the near future, by the addition of the second drum, it will also be equipped with power-handling gear throughout. With this exception the plant has given satisfaction and we think has demonstrated, for deep hoisting, the feasibility of using straight drums, smaller in diameter but driven by engines of higher rotative speed than has been the common practice.

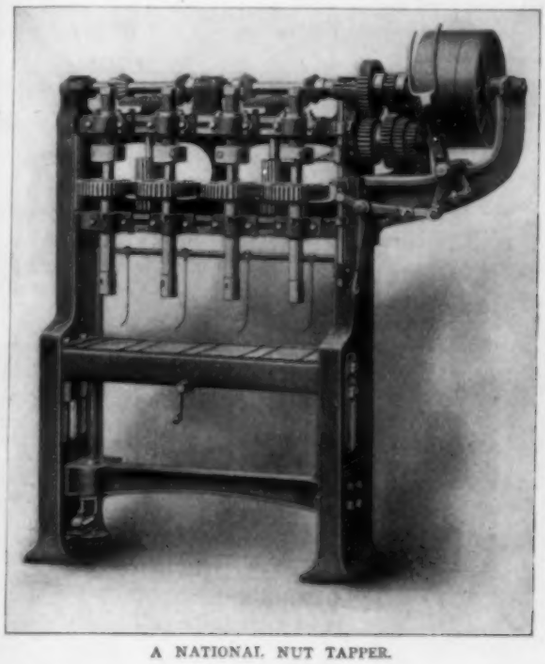
Mrs. Hattie J. Burr has filed a bill for an accounting, the appointment of a receiver and the winding up of the affairs of the Peninsular Tool Mfg. Co., Detroit. She claims to own 269 shares of the company's stock and asserts that John E. Wright William Wright and Wesley Misner have wrecked the company and are preparing to form a new one under Canadian laws, and are now building a plant in Windsor. The attorney for the Messrs. Wright and Mr. Misner states that Mrs. Burr voted for the resolution authorizing the sale of the company's property, and that she voted in favor of a motion confirming the sale. Mrs. Burr asks for an injunction restraining the defendants from disposing, injuring or incumbering the company's property. A temporary injunction has been ordered.

The Excelsior Needle Co., Torrington, Conn., which is one of the principal industries of the Naugatuck Valley, has begun operating its various departments on full time. For several months some of the departments had been running for only five days a week.

FOUR-SPINDLE REVERSING TAPPER.

To understand properly the considerations which led to the design of this tapping machine involves some insight into the common methods by which articles are threaded in machines. Practically all nuts are tapped by running through them a tap with a long thin shank on which the nuts collect. When the shank is full the tap is removed from the machine and the nuts are then dumped off over the back end.

Many articles cannot be tapped by this method, it being necessary for various reasons to back out the tap. Any piece which is to be threaded with a taper hole and this includes nearly all pipe fittings, must have the tap backed out. Also articles which do not have a hole clear through them, must be threaded by first running in the tap and then backing it out. Still other pieces, which are to be tapped only to a certain depth must be threaded by the same process. It is apparent that if a tap is to be reversed it must be provided with a lead screw of the same pitch in order that the tap may clear the threads and not grind around in the hole. When a positive feed in the shape of a lead screw is employed some kind of a relief is necessary which will yield in case the tap



A NATIONAL NUT TAPPER.

misses the hole and strikes solid metal, as otherwise the mechanism might be wrecked. Adjustments are necessary for varying the speed, the distance which the taps will move, for cutting threads of different pitches, for running right or left hand, and means must be provided for quickly and automatically reversing the taps at any desired position. In bringing out the tapper shown an attempt has been made to meet the various requirements and to provide, as far as possible, a machine of rugged construction with ample wearing surfaces.

The halftone shows the general design. Three pulleys, a driving pulley, a reversing pulley and an idler pulley are carried on the horizontal shaft at the top. Next to the pulleys will be seen a cone of gears by means of which the speed of the tapping spindles may be easily regulated. Below the pulleys and carried on the overhanging arm are levers, by which the machine is automatically reversed at any desired position and then brought to rest with the taps in their highest position.

Each tap spindle is equipped with an ingenious relief device which can be so adjusted that any pressure on the tap, within reasonable limits, will cause it to yield. In addition each spindle carries a sleeve lead screw, which can be easily removed and replaced by one to suit the pitch of the tap. The tap spindles are made to revolve for either right hand or left hand threads, by throwing in either one or the other of the bevel pinions shown on the top of the machine.

The table is machined on top, and is equipped with tee slots for clamping the jigs which hold the work. It is provided with means for easily adjusting the height. A system of forced lubrication is used to oil and cool the taps, and carry away the chips into the movable pan.

The operation of this tapper is substantially as follows: When the machine is at rest and the taps are in their highest position, the work is secured in the jigs which are located on the table; the hand lever is then thrown to the left throwing the belt on the driving pulley and starting the machine in motion. The taps rotate and descend at the same time, tapping the work, until a definite position is reached at which point they automatically reverse and back out of the holes which they have just threaded. As the taps reach their highest position, the belt is automatically thrown onto the idler pulley and the machine comes to rest. New work is then secured in the jigs and the operation is repeated.

The machine illustrated occupies a floor space of 6 ft. 5 in. x 3 ft. 3 in. and has a net weight of 3,000 lb. The manufacturer, the National Machine Co., of Tiffin, O., is prepared to build jigs for holding any class of work for tapping on this machine.

Marketing of American Goods Abroad.

The Department of Commerce and Labor is sending out some special reports on the marketing of goods in different countries. These reports list the various imports and briefly describe the credit systems, mercantile agencies and associations, discounts, etc. Consul General Chas. L. Cole has the following to say as a part of his report from Dresden, Germany: "This district is canvassed by traveling salesmen from most countries except the United States. Although some goods are sold from samples, salesmen from Great Britain, France and other countries visit customers periodically, learn what goods are needed, agree upon the terms, and supply their wants with rarely a complaint. American manufacturers expect to compete with this system by sending catalogues printed in English, with United States terms for prices, weights and measures, and, if sales are accomplished, generally ship under an order bill of lading, compelling the consignee to pay invoice cost before seeing the goods. Price lists usually give cost at factory, and when goods are received the purchaser generally finds them saddled with expensive rail transportation to the American seaboard city, adding materially to the cost he counted on. Price lists should give cost f. o. b. at Boston, New York, Philadelphia, Baltimore, or New Orleans, although it would be better to include ocean freight if possible Hamburg is the best German port in shipping to Dresden, because there is water transportation therefrom, by river Elbe, all the way to this city. Consignees in this city frequently complain of poor packing, and this is the fact with machinery, the exposed parts of which are not 'doped' or otherwise protected. Under these circumstances it is no wonder the merchants here prefer to purchase American goods from the large importing houses at Hamburg and Bremen, rather than order direct from the manufacturer."

It is probable that the Republic Iron & Steel Co. will resume its former custom of issuing semi-annual reports of earnings. If it is concluded to do so, the next statement will be issued Jan. 25. The showing for the six months ending with December is expected to be very gratifying. George A. Baird, vice president and general sales agent of the company, expresses the belief that the year 1905, from the standpoint of tonnage, will be a record breaker, provided nothing unforeseen happens.

MOTOR-DRIVEN LATHE FOR PROJECTILE WORK.

The discussion at the recent meeting of the National Machine Tool Builders' Association on motor drives makes the machine here shown of more than the usual degree of interest. This powerful lathe was built by the Lodge & Shipley Machine Tool Co., of Cincinnati, and has been installed in the plant of a prominent firm engaged in the manufacture of projectiles.

The motor is a Ridgway of 15-h. p., with speeds of 350 to 1,750. The controller has 20 speeds, and is operated either from the carriage or headstock. The ratio of back gearing in the head is 1.62 to 1 and 2.62 to 1; the ratio of the motor shaft to the live spindle is 7.48 to 1 and 15.1 to 1. All gearing in the head, that is, the main driving gears have cast iron centers, with machinery steel rims of extra width. The sizes of the spindle bearings are as follows: Front, 7⅞ in. diameter and 8¾ in. long; back, 7½ in. by 5⅝ in. The spindle is of crucible steel .55 carbon and the hole through the spindle is 2⅜ in. diameter.

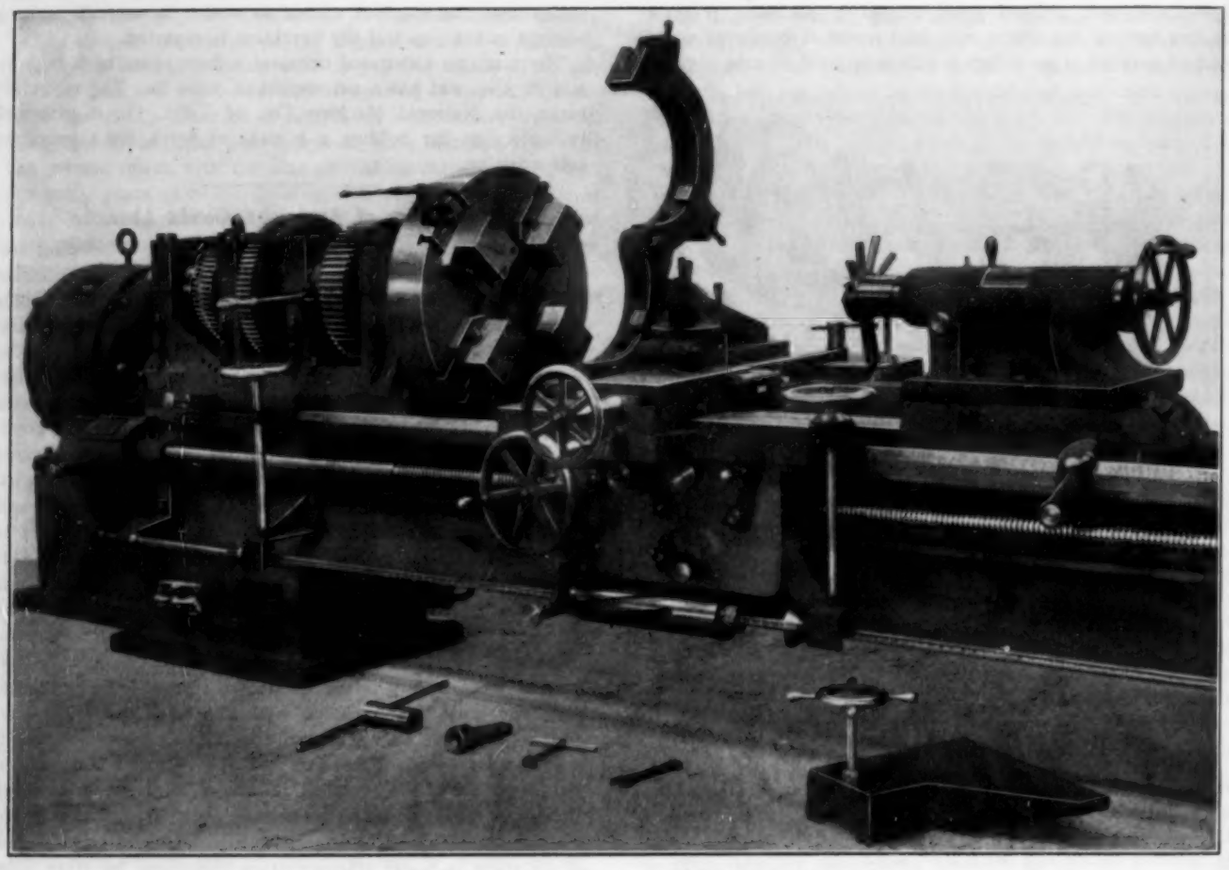


FIG. I.—MOTOR-DRIVEN LATHE FOR MACHINING PROJECTILES.

The lathe is designed so that at the minimum speed of the motor it may have a cutting speed for roughing on the body of the shell, of 30 ft. per minute and for finishing, of 60 ft. per minute. The milled cylinder on the speed control shaft, immediately under the apron, provides an automatic mechanical and full electrical speed variation for varying diameters, so that the cutting speed may be continuous from two inches up to the largest diameter.

The tool post is of steel. There is a special steady rest which is quickly applied and removed. The radial attachments for furnishing several desired curves on the points of projectiles will be noticed in the engravings. The chuck was made by the Lodge & Shipley Machine Tool Co., and as will be seen, is of a most massive and substantial design. The diameter gauges shown on the nose of the tailstock are noteworthy and are found in practice to be great economizers of time. The lathe is of 27 in. swing. The length of bed can be varied to suit the customer, the lathe shown has a 14 ft. bed.

American Iron and Steel Association Report.

The annual statistical report of the American Iron and Steel Association for 1903, from which some extracts were made in recent issues of this paper, contains all the prominent features of previous reports besides several new ones. Special attention has been paid in the report to the statistics of imports and exports of iron and steel, iron ore, manganese ore, coal and coke. Tables are given showing actual imports into the United States of iron and steel and of tin plates from 1872 to 1903, also our actual exports of iron and steel for the same years. Full statistics are given of Bessemer, open-hearth, crucible and miscellaneous steel castings. Valuable, also, are the tables showing the prices of Bessemer rails in the United States and in Great Britain for a long series of years, and also giving the miles of railroad in operation in the United States since 1830 and the displacement of iron rails for steel rails since 1880. These reports answer so many questions that are constantly being asked by those engaged in the manufacture and sale of iron and steel products, that they are indispensable to all who pretend to be even reasonably informed concerning recent developments in the iron trade. The pamphlet contains 94 pages and is well printed, a conspicuous virtue of all of the publications of this association. The price is $3. The report is issued from the office of the association, 261 South Fourth street, Philadelphia.

Edward A. Henry, formerly connected with the Ohio Steel & Iron Specialty Co., Cuyahoga Falls, O., has made an assignment in bankruptcy stating that his liabilities are $109,896 and his assets $171,675.

STANDARDIZING VARIABLE SPEED MOTORS.*

BY W. H. POWELL.

There are on the market today several different systems for operating variable speed motors:

1. The single voltage system, in which speed variation is obtained by field weakening. In this system variation in speed as high as 6:1 has been obtained by special motors.

2. The three-wire even voltage system, in which system a speed variation of 4:1 is obtained.

3. Multiple voltage systems, consisting of three and four wires, in which systems a speed range of 7:1 or as high as 10:1 is obtained.

In determining the proper speed variation for motors driving machine tools there are two points to consider carefully:

First. In all these systems, and also for motors operating at a constant speed, the size and weight of the motor is dependent to a great extent on the minimum speed at which the motor is required to develop its full rated power; and the slower the minimum speed the greater will be the size and weight for a given horse power output. For example, if a given frame and armature core when wound for 1,000 r. p. m. will develop 10 h. p. output at a constant speed and continuous service, it will develop only 5 h. p. when wound for 500 r. p. m. constant speed and continuous service.

Second. As a gear or chain drive is used on motors operating machine tools, the maximum speed of motor is dependent on the tooth speed of the motor pinion, or chain sprocket; or upon the maximum ratio of speed reduction between the driven shaft and the motor shaft. The maximum speed of the motor on most machine tools varies from 1,000 r. p. m. to 1,800 r. p. m.; and, assuming 1,500 r. p. m. is an average value for the maximum speed, we will endeavor to show how the output of a given size motor frame and armature core varies for the different systems of speed control, and also when operated at different amounts of speed variation.

We will assume that a given frame when wound as a constant speed motor at 1,000 r. p. m. will have an output of 10 h. p. for continuous service.

Single Voltage.

When suitably wound for a variable speed motor, to be operated on single voltage, this frame will give an output of 7½ h. p., with a speed range from 750 to 1,500 r. p. m.; and when suitably wound for a speed variation of 3:1 it will give an output of 5 h. p. from 500 to 1,500 r. p. m. In both of these cases the overload capacity at the lower speeds for intermittent duty would be not over 20 percent, while at the higher speeds the overload capacity is practically zero. For machine tool work the rating of the 2:1 motor would be 7½ h. p., and the rating of the 3:1 would be 5 h. p.

Three-Wire Even Voltage.

The speed range of a motor operated by this system is 4:1, and the motor would have a rating of 3.75 h. p. from 375 r. p. m. to 750 r. p. m., and 7.5 h. p. from 750 r. p. m. to 1,500 r. p. m. Its horsepower rating through the entire range of 4:1 would be, therefore, 3.75, and the horsepower rating throughout a range greater than 2:1, and less than 4:1, would also be 3.75 h. p. A motor when operated on this system has an overload capacity for intermittent loads of from 15 to 20 percent, at speeds from 375 to 500 r. p. m. The overload capacity at the speeds from 500 to 750 r. p. m. is practically zero, so that the rating of the motor for machine tool duty would be 3.75 h. p.

Multiple Voltage Systems.

The multiple voltage systems have an advantage over the three-wire even voltage system in that they can be operated at partial speed ranges with an increase in the capacity of the motor. If operated through a speed range of 2:1, that is from 750 to 1,500 r. p. m., the motor would have a rating for a continuous duty of 7½ h. p. It can be overloaded, however, at least 50 percent for a short time at any point in the speed range without overheating or without serious sparking. For the intermittent loads of machine tools the motor could have a rating of 10 h. p. If the speed range was increased to 3:1, and the motor operated from 500 to 1,500 r. p. m., it would have a rating of 5 h. p. for continuous duty; but for machine tool duty it could be rated at 7½ h. p. throughout the range. If the speed range were increased to 4:1 and the motor operated from 375 to 1,500 r. p. m., it would have a rating for continuous service of 3.75 h. p.; but for the intermittent duty of machine tools, it would have a rating of 5.5 h. p. throughout the speed range. It will thus be seen that for a given horsepower output, the size of frame and weight of machine can be greatly reduced if motors are operated on the multiple voltage system, to a greater extent than on either the single voltage or the three-wire even voltage provided the speed range is the same. The multiple voltage systems, however, require a separate balancing set and an increase in the number of the transmission wires to the motors.

There is, therefore, a great demand for variable speed motors operated on the two-wire system. For this system,

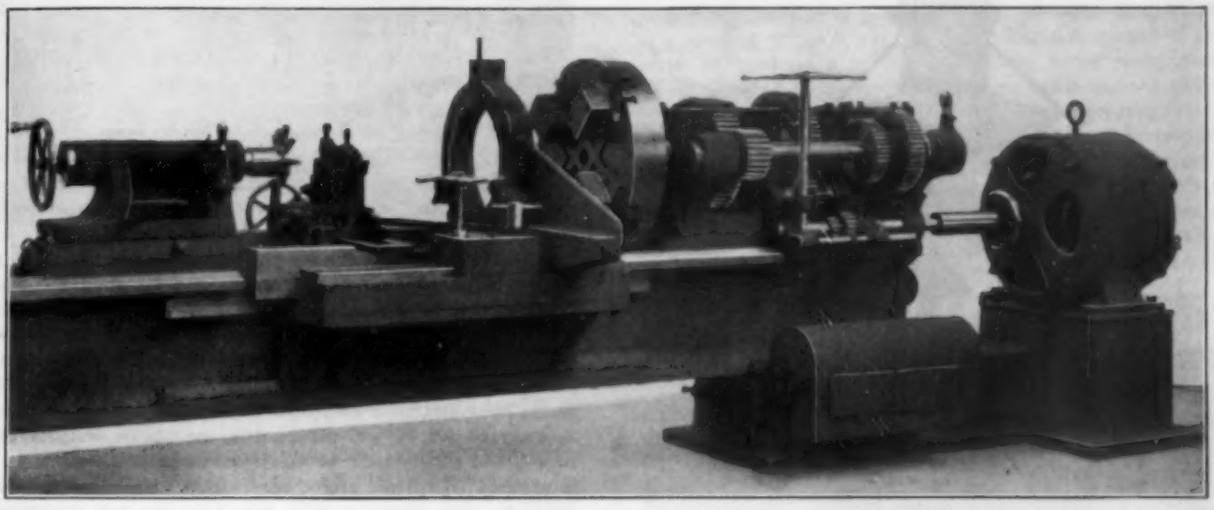


FIG. 2.—REAR VIEW OF PROJECTILE LATHE.

*Read at the New York meeting of the National Machine Tool Builders' Association, Nov. 15. Mr. Powell is connected with the Bullock Electric Mfg. Co., of Cincinnati.

motors with special commutating poles or compensating coils have been placed on the market with a speed range as high as 6:1. A properly designed motor without these special parts can be operated through a speed range of 3:1 without undue heating at the lower speeds, and without sparking at the higher speed; but no matter what the design of motor or the method of speed control, the size and weight, and consequently the cost, is dependent on the slowest speed at which the motor is required to develop its full rated power.

It is, therefore, desirable to keep the speed range down to a reasonable amount, which in our judgment is 3:1, with a minimum speed of 400 to 600, depending on the output of motor.

THE GUNNELL PNEUMATIC FORGE.

The pneumatic forge designed and built by the Gunnell Tool Co., of Manitowoc, Wis., is in portability and efficiency intended as a useful adjunct to pneumatic riveters though as will be seen it has all the requirements for a wider field. The hollow cylinder above the fire holds the fuel, as in the familiar base burner, and the fuel is fed to the fire in a highly heated condition. The cylinder and funnel arrangement from

A NEW FORGE.

which the air hose is led forms an efficient draft inducer and a steady and easily regulated air supply is maintained. The upper part of the forge is pivoted and the workman can readily reach any rivet by rotating the pan. This last is a considerable convenience and saves time in traveling around the fire and at the same time presents the rivets handily. The forge weighs only 50 lb. and will heat 20 rivets at a time The manufacturers claim that the heating capacity is easily 200 rivets per hour and the forge requires but two cubic feet of air per minute.

German navy officials are giving close study to the possibility of gas engines for propelling warships. It is reported that the admiralty is having a rather large vessel fitted out for the purpose of making experiments. At a meeting of the German Society of Naval Architects recently, Engineer Capitaine predicted that gas will replace the present steam engines as well as the turbines. According to the engineer's calculations the present machine utilizes only 12 to 14 percent of the coal's energy, whereas gas engines utilize 26 percent.

PROTECTIVE DECK ARMOR PLATE.

The Cambria Steel Co. began last year at its Johnstown, Pa., plant, the manufacture of nickel steel protective deck plates for the United States navy. These plates range from 1 to 3 in. in thickness and from 20 ft. long by 9 ft. wide to smaller sizes. All of the modern battleships have a shell of this material in the form of a "turtle back," covering the vital parts of the ship from bow to stern. The shell is 4 ft. to 6 ft. below the water line, and is not called on to meet a right angle impact as the heavy armor above the water line and surrounding the guns must. The plates are made of nickel steel because 3 to 3.5 percent of nickel imparts a toughness which greatly increases the ability of the steel to withstand sudden shock.

A selected quality of pig metal, steel scrap and metallic nickel in the form of bars is charged into a 50-ton open-hearth furnace, and a 90-ton crane takes the liquid steel and pours it into five 23,000-lb. molds, bottom-casting on cars to secure the best possible surface. The ingots, after coming from the soaking pits, are rolled on a universal slabbing mill into slabs about 50 in. in width. The hot slabs are carried down a mechanically driven runway to the plate mill furnaces, where they are heated to a uniform temperature and then rolled on the 134-in. plate mill. In the rolling of the steel scale adheres very tenaciously to nickel steel, and fine coal is thrown on the plate, which when forced in close contact between the roles with the hot slab, shoots out flames 10 ft. to 15 ft. in length, and towards the latter part of the rolling the procedure is followed of using salt to further remove the scale, the salt exploding with great violence under the roll. After the plates are rolled they are sheared or sawed to size and subjected to tempering and annealing. In tempering, the plates are brought up to a temperature of about 1,500 deg. Fahr., then instantly plunged into a large water tank, being handled by an overhead crane. This process raises the strength in the steel, on an area of an inch square, from about 75,000 lb. to 100,000 to 120,000 lb. tensile strength, and the sudden cooling prevents the coarse crystallization, giving a fine fibrous structure. This, however, has so increased the brittleness that it must be annealed at a temperature of 700 to 1,000 degrees, so that the tensile strength is reduced to about 85,000 lb. per sq. in. This material is subjected to bending and tensile tests, is analyzed for carbon, phosphorus, manganese, sulphur and nickel, and is subjected to rigid surface inspection. A plate is selected from each group, which must meet a ballistic test by being shot at with a 6-in. gun with charges of different strength, depending upon the thickness of the plate.

The Cambria Steel Co. has furnished all the plates and structural steel for the battleship Minnesota, being built by the Newport News Shipbuilding & Dry Dock Co., and for the battleship Vermont, being built by the Fore River Ship & Engine Co., in addition to supplying considerable material for other battleships. The Newport News Shipbuilding & Dry Dock Co., which is now erecting five United States battleships, has made a new record for rapid construction on the Minnesota, which was about 40 percent completed on Sept. 1, the keel of this vessel having only been laid during December of 1903. It usually takes three to four years to complete a battleship.

The right of over 100 families, involving nearly 600 people. to occupy the land which they and their predecessors obtained from Jacob Muza on Jones island twenty years ago, has been confirmed in the decision handed down by the Wisconsin supreme court in the case of Xaver Jeka against the Illinois Steel Co. The company held a record title but the people living on the land claimed to be entitled to it by right of adverse possession and on the ground that they had lived there continuously for twenty years. The property affected by the decision amounts to over half the island and has an estimated value of $2,000,000. Jones island lies off Milwaukee and was formerly submerged, but has been raised above the level of the lake in recent years by filling in and by drift sands. The land is really a peninsula.

AN APPLIANCE FOR "SKULLING" LADLES.

At many of the larger blast furnaces where ladles are employed for the conveyance of the hot metal to the casting machine, or to the mixer, one of the problems is the handling of the "skull" which forms along the sides and bottom of the ladles. This increases in depth and thickness until it is

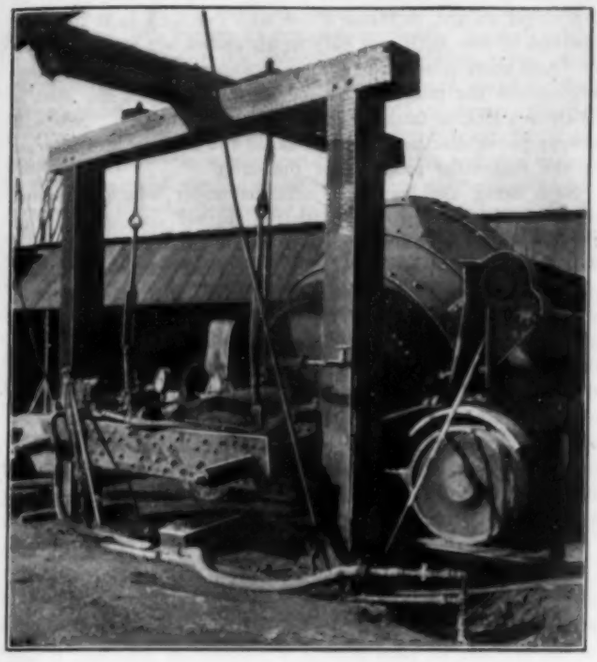


FIG. 1.—A LADLE-SKULLING MACHINE.

necessary to have the ladles "skulled," as the operation of taking out the chilled metal is termed. The old method of doing this was by means of a gang of men equipped with large bars or "ringers." A furnace manager of wide experience tells of a half dozen men making a six-hour job of "skulling" a ladle.

Various improved methods have been devised. Felix McCarthy, of Pottstown, Pa., has recently taken out a patent for materially cutting down the time required for "skulling" ladles. In the illustrations, the invention is shown in use at a blast furnace. In practice it has been found possible to skull a ladle with the machine in fifteen seconds. A boy can attach the necessary mechanism and eject the skull from the ladle. Two lugs are riveted on the ladle. These are located on either side and near the bottom. A 4-in. hole is cut in the bottom of the ladle and to this opening is applied the piston of the power cylinder. The latter is operated by hydraulic or steam pressure. The side rods hold the ladle in tilted position opposite the cylinder and the pressure behind the piston rod forces out the skull. A taper brick is fitted to the hole in the bottom of the ladle when the latter is relined and all that is to be done when the skull is removed is to put a new taper brick into the opening and the ladle is ready for use as soon as it is clayed up. It will be seen that the use of the ejector will not destroy the brick lining of the ladle. This skulling machine is an addition to the line of blast furnace appliances already manufactured by the inventor.

Rivals of the Steam Engine.

Prof. G. F. Charnock, in a lecture delivered recently before the Bradford Engineering Society at the Technical College, Bradford, Eng., commented on the low efficiency of the steam engine and said he had shown on a former occasion that the production of electricity direct from fuel without the intervention of the steam engine does not in the present state of our knowledge admit of success. A much more likely competitor is found in the internal-combustion, or, as it is more popularly known, the gas engine. While it is true that remarkable progress has been achieved with that form of motor during recent years, there are still mechanical disadvantages which prevent it being regarded as a serious rival to steam, except under special circumstances, such as the utilization of the waste gases from blast furnaces or coke ovens, etc.

Prof. Charnock noticed some of the proposals which have been made recently for utilizing the heat of exhaust from steam and gas engines, the most conspicuous being the reintroduction of the binary vapor engine. Prof. Josse had carried out at the Technical School in Berlin some experiments on an engine working with sulphurous oxide, and he had succeeded in rendering the idea so far practicable that there were now many such engines in use in various parts of Germany, effecting a saving as compared with an ordinary steam engine of, it was claimed, as much as 34 percent. An example of a 450-h. p. engine of this type at work at a spinning mill at Steinen in Baden was illustrated and referred to. The experiments of Prof. Josse and a description of his engine were treated at length in *The Iron Trade Review* of Oct. 10, 1901.

Numerous cases of the employment of other vapors than steam have been mentioned since the suggestion of Sir Humphrey Davy over a century ago. In 1830 Mr. Ainger, at a meeting of the Royal Society of England, suggested that ether be used as a secondary fluid in series with steam. These working fluids for use in series vapor engines should have boiling points at or below the condensation temperature of the steam. Such fluids comprise the lighter petroleums, ether, alcohol, sulphur dioxide and ammonia. The corrosive, explosive and other objectionable qualities have had much to do with the discouragement of their practical introduction to the industries generally. The degree of success attained in Germany as announced by Prof. Charnock is very gratifying and would suggest that the disadvantages inherent in the type have been handled satisfactorily.

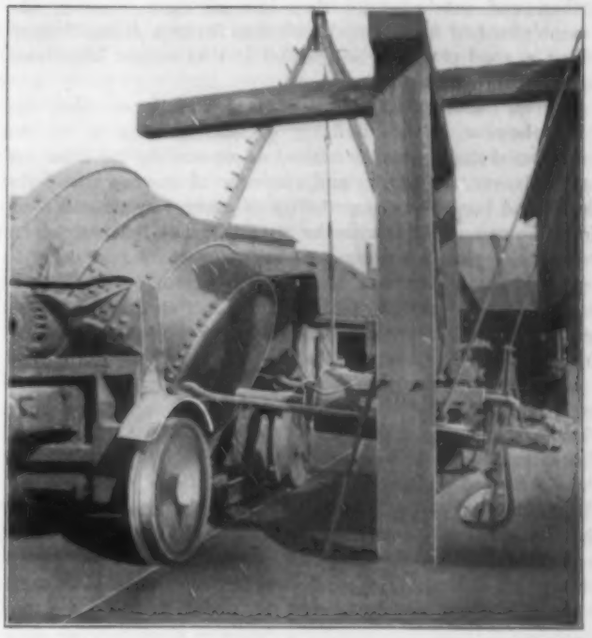


FIG. 2.—ANOTHER VIEW OF LADLE-SKULLING MACHINE.

The New York Central, the Pennsylvania, the Reading, the New Haven and other railroads centering in New York City have recently restored to their pay-rolls a great army of employes, estimated to be between 20,000 and 25,000, who were dropped last summer on account of languishing business.

MACHINE SHOP MANAGEMENT.

BY OSCAR E. PERRIGO.

This article concerns the management of a model machine shop or manufacturing plant in a general way, leaving the scheme of the different departments in detail for later consideration.

Probably no one will take exception to the proposition that we shall have reached the perfect system of management when we shall have devised methods by which we may produce the greatest amount of good work, with the smallest number of employes and the least amount of friction and irritation among them.

How this is to be accomplished is worthy of the most patient investigation, for the question of the management of machine shops and manufacturing plants is one of many phases. There are several general propositions in this connection that should be briefly stated. Among them are the following:

Some Prime Facts Concerning Systems.

First. Any reasonable system is better than no system at all. There are shops today running, or trying to run, in which there is really no system worthy of the name, and things are allowed to drift along from day to day "by guess and good luck," just as they did forty years ago, and if we inquire why this or that thing is done so and so, we get the stereotyped reply, "That's the way we've always done it." One of these days these shops will "wake up and find themselves dead," as the Irishman said, or they will adopt some kind of a system that will be of modern brand.

Second. The adoption of a part of a system, or a system for one part of the works and not for the remainder, "just as a trial to see how it will work," is practically no better than no system at all."

Third. The endeavor to adopt a system composed of parts of various systems, grafted upon, added to, dovetailed together, and patched until they lose all their identity, like Joseph's coat of many colors, is but to invite a dismal failure. Many a good plan has been killed and its author humiliated by adopting it piecemeal.

Fourth. To be successful the system must be complete and comprehensive, clearly defining every regulation as to the progress of the work, the method of accounting for time and materials, records of pay and efficiency of employes, and the duties and limitations of authority of every person concerned, from the manager down to the errand boy, so that the fewest cases may arise that have not been provided for in the system, and that there may be as much certainty and distinctness as in the regulations of the United States Army. Then we shall realize the highest efficiency and the least amount of friction.

Fifth. The system must be carried out in every particular as it is planned, unless there are very serious reasons for a change. Of course, even the Constitution of the United States can be amended, but only for weighty reasons, and "while it stands, it goes." Shop regulations should be on the same basis, and all employes will soon come to respect them, and to realize that they operate just as much for their welfare and protection as for the benefit of the owners of the plant; that so long as they are obeyed in a spirit of faithful service the employe is always right; and that when they are disobeyed through carelessness, a desire to shirk duty, or even from the "smart Alek" notion that some employes get into their heads, there is a good prospect for trouble to the offending parties.

Sixth. The man who is to manage the administration of the system must be strong, able, honest, fearless and positive. He must be strong in carrying out the system that has been adopted. Otherwise his weakness will be soon discovered by his subordinates and the "backbone" of the system will be broken. He must be able, both by education and experience, to understand and appreciate all the details of the business. Of course, he must be honest in all his dealings with his subordinates as well as with the owners. He must be fearless, giving his orders where and when and to whom they are necessary and take the responsibility for their effect when faithfully obeyed. Hesitation, vacillation, or indecision will very materially injure his authority. To give an order, and when it has been obeyed faithfully and failed of the object sought, to blame those who executed it, is to cause his men to lose faith, not only in his ability but in his sincerity. And there is only one thing more damaging to the administration in the minds of the employes than this, and that is to show a lack of faith in their ability and honesty. This will always prove discouraging and cause the men to lose interest in the successful progress of the shop.

Such being the general conditions under which we must organize, we may proceed with the further consideration of the system by which our plant is to be managed. We must first know what we are to plan for. It is assumed that the plant and all its accessories have been designed and equipped for manufacturing only. Therefore, with the exception of shipping facilities, the entire establishment is devoted to turning out and shipping what it is directed to make. To accomplish the results we seek, we must go about the matter with a definite and comprehensive plan. It will not do simply to decide some of the main features and leave the others to be determined as we go along. If we do so we shall probably be surprised to find that some of the minor matters will loom up as important features when we least expect trouble.

Plan of Organization.

We will consider the scheme of organization. In deciding what plan is best we should look to efficiency as the first requisite. This will include the question of making the most of the services of each man in a responsible position; it will include the consideration of a plan that shall have the least friction between the different officials in the routine work of the shop. It will seek a proper division of responsibility, so that if anything goes wrong we may at once determine what man was responsible for the lack of attention to duty. It should be a plan that will produce a maximum of result with a minimum of effort. Every man must know exactly what his duties are, what are the limits of his authority, as well as from whom he takes and to whom he may give orders.

It will be understood, of course, that the entire management of the plant is under the charge of the superintendent and that all orders from the general office go to him direct, and that there is no interference with any other official of the shops by the general manager or anyone in the general office. This sort of interference "over the head" of the superintendent will break up the discipline of any shop, and it should never be indulged in by the authorities in the office or permitted by the superintendent. It should be the same with all officials in the shop. No official or employe should accept any order unless coming to him in the regular way through the next higher authority.

We think it has never been seriously questioned, that the organization of the United States army, with its division of responsibilities, the provisions for accounting for all property handled, and for ascertaining the final results, as well as for keeping a definite record of the individual efficiency of both officers and men is a well-nigh perfect system. Its practical utility is not thoroughly appreciated by the manufacturers of today, who are prone to look upon anything labeled "military" as savoring of arbitrary and summary methods that in the shop would be disagreeable to both employer and employe. That this is too apt to be the popular impression is evident from the remarks of a recent writer on this subject who says:

Under the military type of organization the foreman is held responsible for the successful running of the entire shop. He must lay out the work for the whole shop, see that each

piece of work goes in the proper order to the right machine, and that the man at the machine knows just what is to be done and how he is to do it. He must see that the work is not slighted, and that it is done fast, and all the while he must look ahead a month or so either to provide more men to do the work or more work for the men to do. He must constantly discipline the men and readjust their wages, beside fixing piece work prices and supervising the timekeeping.

This is hardly a fair conception of what military rules mean, as it is surely anything but military. No miltary officer has any such variety of duties to perform. As well might it be contended that the colonel of a regiment takes command of the police guard or drills the awkward squad, or that a captain teaches the recruits the manual of arms. On the contrary, the colonel commands a regiment, but he gives orders to his majors who command battalions and give orders to the captains of companies. They in turn give orders to the non-commissioned officers who instruct the enlisted men. Each officer has his clearly defined duties, authority and limitations. It is true that the organization and management of many of the larger and more successful manufacturing companies in this country today are using systems very closely modeled after the military methods, and in many cases, as investigation will show, following the army methods much more closely than is realized by many men.

The Military Idea in the Shop.

Let us consider for a moment the analogy which may exist between a regiment of infantry and a large machine shop plant, with its force of officials and employes. The general manager may be likened to the general in command, and the machine shop or manufacturing plant to a part of an army, say, a regiment of infantry on active service. The colonel in command will be represented by the superintendent or works manager. The colonel must have a staff, each of the officers composing it being at the head of one of the staff departments. So here we must have a staff, and it will consist of the office force, and include the chief clerk, purchasing clerk, time clerk, cost clerk and the stenographer, all reporting directly to the superintendent. A regiment is divided into two or three battalions commanded by majors. Our force will be divided into two parts, each under an assistant superintendent. Each battalion is composed of a number of companies, commanded by captains. Our two groups are divided into certain analogous departments each in charge of a foreman. Our arrangement will be for the first assistant superintendent to have charge of the drawing room, pattern shop, tool room, experimental room, stock room, power house, iron foundry, forge shop, carpenter shop, paint shop, shipping room and the yard gang.

The second assistant superintendent will have under his charge all of the strictly machine shop departments, consisting of the planing department, heavy turning department, drilling and boring department, milling and gear cutting department, small parts department, grinding department, polishing department, finished parts store room, small parts assembling department, erecting department and inspecting department.

This, then is the skeleton of the plan of our organization and from this we may make up what is called in army parlance, the roster. This will include all responsible officials, commencing with the superintendent and the office force, then the assistant superintendents, foremen, etc. A little further on we will add others more intimately connected with the workmen.

Superintendent's Functions.

This plan requires the superintendent to look after his office force as to accounting, purchasing, issuing, time keeping, pay roll, manufacturing costs and the correspondence, and to hold the two assistant superintendents responsible for all of the requirements of their respective jurisdictions. In a plant of the capacity which we have been considering and the force employed this will be all that one man can be expected to do. In the same manner the two assistants will find their time quite steadily employed in the successful management of the eleven or twelve departments in their charge. The assistant superintendents should be men of good executive ability, good machinists and understand in detail the operations of machining and working every variety of work or material handled under their supervision. They should understand drawings thoroughly and be able to make any of the calculations usually made in the drawing room. They should understand the character of the men under their control and the characteristics of machinists or other tradesmen working under them. While they are officials capable of handling men by direct contact with them, their positions now place them one step beyond that, and all matters of instruction as to the work, the everyday routine in passing work from one department to another, the discipline of the force under their charge, should be done with the foremen, and never with the men. An infallible rule for injuring the efficiency of a shop official of whatever rank, is for some higher authority to ignore him and pass orders on to the grade below him, or, in shop parlance, to "make a bridge of his nose." The foremen, in turn, give the work to the gang boss having charge of similar work and he instructs the workmen when necessary and sees that the work is pushed along. This may seem a little like "red tape" but it is at once the quickest, surest and safest way to manage the shop, and one that will produce the greatest amount of good work with the least friction and ill-feeling on the part of the employes. Still any official witnessing a violation of the sanitary, or, of what may be called the police regulations of the establishment, is expected to call the offender to account and later to report him to his foreman.

The Foreman and His Work.

The foreman should be a man of excellent mechanical ability, understand drawings thoroughly and be able to make any of the ordinary calculations necessary. He should be able to make estimates as to time, cost and material, of anything handled in his department. He should know the characteristics of men in general and the abilities and dispositions of those under his control. If his room is large enough to have gang bosses he should give his orders to them, and not to individual workmen. He should know every item of work passing through his room, keep things moving in it, and see that work transferred to him from another department is in proper condition and is promptly used and that the product of his department going to another one is in proper condition for the transfer and is passed on without unnecessary delay

It is not at all necessary that the foreman of a small department, or over a few men, should devote all, or even a large percentage of his time to strictly foreman's duties, as he may be able to do considerable work himself while directing others. The point is, to have one competent man in charge of the force, the gang, the room, or the department, whom we can hold responsible for the results in that department. In the same way some departments may be large enough to require gang bosses, or assistant foremen. These men may do some machine work themselves, but it frequently happens that it pays better when they do not, but on the contrary give their entire time and energy to keeping things moving; to seeing that the operatives at the machines are supplied with proper tools and materials, that their product is promptly moved out of their way when completed; and that everything moves harmoniously, with proper speeds and feeds on all the machines. The gang boss may thus make himself a very useful man. There is another view of the question. The gang boss is very likely to be more in the position of "one of the gang" than the foreman, more closely affiliated with the workmen of his gang than a foreman is ever likely to become and the men will naturally feel more interest in their work under his direct leadership because of this.

In our analogy of the plan of organizing and administering the affairs of a manufacturing plant to the military organiza-

tion, we had got to the foreman as corresponding to the captain. Our gang bosses will fittingly represent the non-commissioned officers. These are privates of more than ordinary ability and faithfulness and have been promoted for these reasons. They are the real leaders as well as instructors of the privates and form what might be termed the connecting link between them, as a class, and the commissioned officers. So should the gang boss or assistant foreman be, and his influence for good in the smooth running and harmonious, as well as efficient and profitable, conduct of the shop, is a very important matter which should receive the most careful consideration in the organization and operation of the plant. The gang boss should be a man properly qualified for the position; able to read drawings readily; to know enough of human nature to "size up" the abilities of the men under him, and to know, not only each man's practical knowledge of the business, but his natural disposition, so as to be able to direct him intelligently and for the best good of the establishment. In the foregoing remarks as to foremen, etc., those of the machine shop proper have been meant. But in a general way the principles are equally applicable to those of other departments.

The first formal report of J. J. Sullivan, receiver for the Aultman Co., Canton, O., has been filed with the clerk of the federal court at Cleveland. The total assets are $1,644,070. The direct liabilities are $890,003. The company, as endorser of the paper of its allied corporations, has a very much larger liability, which brings the total liabilities up to $4,660,430. From this sum can be subtracted $435,131, that amount being almost certain to be cleared away by the payment of indorsed paper. That would leave the total liabilities of the company to be met at $4,225,298. The company has indorsed paper for the allied corporations as follows: Western Supply Co., $943,081; Cedar Rapids Supply Co., $803,678; E. T. Kenney Co., $371,487; Kenyon-Rosing Co., $365,654. In addition there are the indorsements for the Arctic Machine Co. and the general indorsements of its trade paper as follows: Arctic Machine Co., $851,392; general trade paper, $435,131. This makes a total of $1,286,524, and when combined with the total amount above, makes a grand total as indorser of $3,770,426. When the direct liabilities of $890,003 are added, it makes the total direct and indirect liability of the company amount to $4,660,430.

The report of Brigadier General William Crozier, chief of the bureau of ordnance, shows that over 5,000 workmen are employed in turning out the arms and equipment, not including clothing, of the army, navy and militia of the United States. The cost is over $13,000,000 a year, as follows: Manufacturing arsenal at Watertown, Mass., where seacoast gun carriages are made, $660,471; manufacturing armory for small arms at Springfield, Mass., $1,482,441; manufacturing arsenal at Watervliet, N. Y., where large and small cannon are made, $705,165; Sandy Hook proving ground, $209,516; Frankford arsenal, Philadelphia, where ammunition for small arms and mobile artillery is turned out, $1,784,064; arsenal at Rock Island, Ill., for the manufacture of personal and horse equipment, carriages for mobile artillery and small arms, $2,688,301. The expenses of the ordnance office were $1,366,131.

J. P. Luce, who successfully managed the Harrisburg, Pa., rolling mill and tin plate works of the Lalance & Grosjean Mfg. Co. for the past four years, has resigned in order to embark in the general foundry and machine business in Harrisburg on his own account. He has leased the foundry and machine property of W. F. Bay & Bro. and will take possession Dec. 1. This plant, which has been idle for a long time, will be rehabilitated by Mr. Luce. The new concern will be known as the Harrisburg Iron Co.

LAKE SUPERIOR IRON MINES.

The Beta property in the Iron River district of the Menominee range has entered the producing list to the extent of 5,000 tons of ore, as a sample consignment, which will be sent out this season. The work of opening the mine will continue during the winter and it is expected that the property will be a regular shipper next spring. The Beta is being developed by the Mineral Mining Co., a subsidiary to the Pewabic Co.

Contrary to expectations, all the ore in stock at the Steel Corporation's Aragon mine at Norway, Mich., has been forwarded and the stocking grounds are being prepared to accommodate the hoist of the coming winter. A large force of men will be employed.

The iron mines on the Menominee range will have another railroad added to their present facilities. The Wisconsin & Michigan is pressing its way steadily westward along the range, and before winter will be nearly to Iron Mountain, Mich. Its construction crews have already reached Florence, Wis. The right of way from Florence to Iron Mountain is across absolutely unbroken country.

At Marquette, Mich., Judge Stone has filed his decision in the Cleveland-Cliffs Iron Co. against Lewis Corbit, which involved the title to a wedge shaped strip of land at Negaunee on which the Cleveland-Cliffs Iron Co. has sunk its sunk its Maas mine shaft made other improvements. The court finds that the complainants are entitled to the decree quieting their title and removing all clouds therefrom.

The Chapin mine, of the Menominee range, suspended shipping operations to the Escanaba docks last Saturday. The shipments for the season are about 540,000 tons, leaving considerable ore in stock. This is about 160,000 tons less than the total for last year and is the smallest season's shipment since 1896.

Many improvements will be made to the mining plant of the Antoine Ore Co., Iron Mountain, Mich., before spring. A new building for the power plant will be erected. It will be equipped with a battery of three boilers, each of 150 h. p. A new and larger compressor will be added to the plant and perhaps a more powerful hoisting equipment.

The old shaft of the Mansfield mine at Iron Mountain, Mich., is a complete wreck, being wholly closed by a recent fall of ground from the third level to the sixth and has been stripped from the sixth to the bottom. The pumps are located on the bottom level and have been operated steadily since mining was suspended some months ago, but are now under water. The accident was not unexpected, as ore about the shaft had been caving for some time. Two men who were on the bottom level operating the pumps escaped just in time to save themselves from being caught by the cave-in. President Cole is expected at the mine to investigate and in the meantime no attempt is being made to repair the damage or rescue the pumps.

Superintendent Richards, on orders from Corrigan, McKinney & Co., has started pumping out the water in the Dunn mine, Menominee range. The Dunn promises to be a big producer again. It was supposed that the deposit was practically exhausted, but recently the operators came upon a new ore lens.

An unusual decision was rendered a few days ago at Baltimore in a suit of Rebecca Burch against the Maryland Steel Co. for $25,000 damages on account of the death of her son, Robert M. Burch, who was killed while in the employ of the company. The attorneys and witnesses were denied the privilege of visiting the plant where Burch was killed. The Superior court thereupon granted an order to compel the company to allow the attorneys and witnesses for the plaintiff to inspect the plant.

OBITUARY.

James Barr, superintendent of the Finished Steel Co., Youngstown, O., died Nov. 20 from injuries received by falling a vat of hot lime water. Mr. Barr was born in 1869 in Scotland and came to this country when 17 years old, locating in Allegheny. He went to Youngstown four years ago and for two years had been superintendent of the Finished Steel Co.

Dr. Thomas M. Brown, president of Lehigh university, died Nov. 13 at South Bethlehem, Pa. He was born March 19, 1842, and his fame rested particularly upon his work as a chemist. He was appointed in 1890 a member of the international committee to devise standard methods for the chemical analysis of iron and steel, and he personally made analyses to aid the discussion on this subject. In recognition of these labors and his services to the American Institute of Mining Engineers, he was elected in 1884 one of its honorary members, and in February, 1897, he was made its president.

Stricken with heart disease on his lawn at Pottstown, Pa., Nov. 21, Joshua B. Lessig died in a few moments. Mr. Lessig was one of the organizers and for years treasurer and secretary of the Ellis & Lessig Steel & Iron Co. He was 53 years old.

William H. Blymyer, of Cincinnati, died last week at Evanston, Ill. Mr. Blymyer was born in Mansfield, O., 70 years ago and engaged in the iron business in that city as a member of the firm of Blymyer Bros. & Co. He went to Cincinnati in 1869 and established the firm of Blymyer, Norton & Co., manufacturers of sugar machinery. Mr. Blymyer was also one of the founders of the Blymyer Iron Works Co. and later became president of the Blymyer Ice Machine Co. He lost a considerable part of his wealth in the failure of the latter company.

Personal.

L. W. Knight, of the Dean & Knight Co., 320 Sansome street, San Francisco, has been in the iron and steel centers of the Central West in the past two weeks arranging to represent various manufacturers of iron and steel products on the Pacific coast.

S. W. Croxton, of Cleveland, president of the Penn Iron & Coal Co., Canal Dover, O., has gone on a three months' trip to Egypt.

J. A. Laurie, of Toledo, O., has been appointed manager of the C. G. Bretting Mfg. Co., Ashland, Wis.

John Finnerty has been appointed superintendent of the Madison mill of the American Car & Foundry Co., Madison, Ill. Mr. Finnerty was formerly assistant superintendent of the Valley works of The Republic Iron & Steel Co., and afterward went to Cuyahoga Falls, O.

William M. Barnum has been elected a director of the Railway Steel Spring Co. to fill a vacancy caused by the death of S. R. Callaway.

George K. Tinker, who for five years has been Eastern representative of the Wheeling Steel & Iron Co., will hereafter look after the Eastern interests of the Mark Mfg. Co., of Chicago and Zanesville, O., manufacturer of merchant pipe, boiler tubes and special pipe.

F. B. Manville has resigned as president and general manager of the Fitchburg Machine Co., Fitchburg, Mass., owing to ill health and the pressure of other business.

Joseph Hartley, superintendent of the Corrigan-McKinney furnace at Charlotte, N. Y., has resigned to take a similar position with a company in Nova Scotia. He will be succeeded by John Corrigan, nephew of James Corrigan, of Cleveland.

Dr. Louis Duncan has been retained by the Allis-Chalmers Co. as an expert in electrical patent work in connection with its electrical department, the Bullock Electrical Mfg. Co., of Cincinnati. This connection has been made possible by the retirement of Dr. Duncan from the chair of electrical engineering at the Massachusetts Institute of Technology, to devote himself entirely to work as a consulting engineer and expert. His headquarters are at 56 Pine street, New York.

CHANGES IN INTERNATIONAL HARVESTER CO.

(Special Telegram.)

CHICAGO, Nov. 30.—Several important changes have been made in the executive management of the International Harvester Co., all to take effect Dec. 15. W. O. Jones, formerly assistant purchasing agent, has been made general manager of the purchasing department, succeeding H. F. Perkins, who has been placed at the head of the newly created steel department. The manufacturing department, of which E. A. S. Clarke had been general manager up to the time of his resignation to accept the presidency of the Lackawanna Steel Co. has been divided into two departments, one to look after the steel mills of the company at South Deering, the ore mines, coal properties, etc., and the other to manage harvesting machinery manufacturing. It is the former department of which Mr. Perkins has been placed at the head, while Geo. F. Steele, formerly general manager of the collection department, has been placed at the head of the harvesting department, with the title of general manager of manufacturing. Mr. Steele will have three assistants in his department. B. A. Kennedy, formerly general superintendent of the Deering works and later assistant to Mr. Clarke, is first assistant; John G. Wood, formerly general superintendent of the McCormick works, second assistant, and E. F. Jones, formerly assistant to the general manager of manufacturing, third assistant. F. A. Kauffman has been selected to succeed Mr. Steele as general manager of the collecting department.

Large Sales of Lathes.

The heavy purchases of engine lathes made in the United States on behalf of the Japanese government in the past 90 days have made a very firm market in that department of the machine tool trade. Some purchases on Russian government account, presumably for use in projectile work, have also been made, but owing to the tariff policy of Russia, which in some lines has been almost prohibitive of American exports to that country, the volume of recent business is small as compared with the Japanese orders. It has been estimated that since early September the Japanese government has bought in the machine tool centers of the United States between 1,500 and 2,000 lathes. One lot on which bids were asked included 1,000 lathes. In one case an American manufacturer of lathes has had to decline further orders from the Japanese. Another firm was unable, in response to a recent inquiry, to offer any but odd lathes, reserving its standard machines; and in a third instance a Central West company manufacturing lathes was compelled to decline an export order for Japan, because of the fear that deliveries of machines to its domestic connections might be interfered with.

Activity of Sheet and Tin Plate Mills.

Within the past ten days 106 idle tin plate mills of the American Sheet & Tin Plate Co. resumed operations and the indications are that the remaining fifty idle mills of the company will resume before the first of the year. The Humbert plant at Connellsville, Pa., with six mills, resumed this week; the Sharon works, South Sharon, Pa., placed ten of its twenty mills in operation on Wednesday; at Martins Ferry, O., 16 mills resumed, while 30 of the mills of the Shenango works at New Castle are in operation for the first time in several months; the Star works, Pittsburg, with 8 mills, resumed this week and the Crescent works, Cleveland, O., and the Ellwood, Ind., works recently placed 26 mills in operation.

T. C. Kenney, formerly connected with the firm of Kenney & Co., Scottdale, Pa., which was reorganized under the name of the Scottdale Foundry & Machine Co., intends erecting a plant at Scottdale for the manufacture of coal and coke works equipment. Three buildings will be built, each 72 x 120 ft. A site has already been secured.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades and Iron and Steel Manufacture.

PUBLISHED EVERY THURSDAY BY

THE PENTON PUBLISHING CO.

CLEVELAND, OHIO.

CHICAGO - - - - - - - 1164 Monadnock Block.
PITTSBURG - - - - - - - 429 Park Building.
NEW YORK - - - - - - - 150 Nassau St.

Subscription, $3.00 per annum. To Foreign Countries, $4.50. Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

DECEMBER 1, 1904

THE SHEET AND TIN PLATE INDUSTRIES.

It is easily recalled that in 1902, when demand for iron and steel products generally was at the top notch, and so much in excess of the normal supply that premiums were freely paid and much material imported, there was general complaint of an excess of productive capacity in sheets, while to a less extent this was also true of tin plates. From both natural and artificial causes there had been for two years previous a distinct era of sheet mill and tin plate mill building. In 1901, while other steel products either held their own or advanced, sheets suffered a decline in the open market price of some $7 per ton, and the close of the year 1902 saw a further decline of $5 per ton. Tin plates suffered a net decline in the two years of $8 per ton.

It seemed to be the general opinion at the close of 1902 that the declines in prices of these two commodities had been due simply to the excess of capacity, and that the independents, and perhaps the leading interest, also had "a hard row to hoe." When in the following year it became evident that the crest of the wave of demand had passed for iron and steel products in general, and that the trade had little more to hope for than the maintenance of a substantially unchanged demand for a few years, it was inferred that the excess capacity in sheets and tin plates would be severely felt until a fresh "boom" revived the industry.

The aspect of the sheet and tin plate trades is now entirely different. Through successive declines the market price of sheets reached a point early in the summer from which no further decline was possible, and they have stubbornly remained at this level. That it involved no absolute loss has been shown by the fact that the mills have remained in operation. For several months nearly all the regularly operative sheet mills have been running, and not only does the list include some 35 or 40 mills which were only in course of erection in the fall of 1902, but the output per mill at the union plants has been increased by some 10 percent.

Unfortunately there are no exact statistics of production of sheets by which the increase can be studied. Rough estimates only can be made; yet it can be said with considerable confidence that the production of sheets in the current year will be in the neighborhood of 25 percent greater than that in 1902, while it is probably double that of some six or eight years ago.

One general cause of the increased consumption of sheets has been the lessened cost. The price which has prevailed in the past few months has been within, say, $5 per ton of the lowest price on record. It is in some respects better, however, to have regard to the relation between the price of sheets and of crude steel. In 1898 a comparison was made by the sheet manufacturers' association, which showed that the spread between a long ton of billets and a short ton of No. 28 gauge sheets had decreased from approximately $37 in 1893 to scarcely more than $25 towards the close of 1897. Since then the spread has decreased still more, and has of late touched $20. Naturally the decreased price of sheets has led to an increased consumption. In the use of sheets for electrical work a large and increasing tonnage is being absorbed. The increased demand for fireproof structures has involved many new applications for sheets. All this development is bound to continue.

For many years the consumption of tin plate in the United States was practically stationary. In 1897 the domestic production, plus imports, amounted to 340,000 gross tons, and this was but slightly in excess of the imports in the years immediately preceding the inception of tin plate making in the United States. Excluding the imported tin plates which were re-exported the domestic consumption fell considerably short of 300,000 tons in that year. In 1899 production for domestic use scored a large increase, to 360,000 tons. In 1901 a further increase, to 400,000 tons, was noted, while last year the production is estimated by Mr. Swank at 480,000 tons, equal to almost double the domestic consumption a half dozen years earlier. The increase is a striking one.

ECHOES OF THE BRITISH VISIT.

Naturally there will be some curiosity to know what impressions were made upon the members of the Iron and Steel Institute who recently made a tour of some of the iron and steel centers of the United States. The visitors, with a courteous appreciation of the facilities afforded them for making investigations, naturally would not speak freely while here of any features of American works management which might not appear to them to be up to the British standard. However, we have not been in doubt as to the opinions entertained on the other side, of American achievement in iron and steel manufacture, since there has been a pretty steady stream of visitors from Great Britain to the United States in the past half dozen years. Perhaps the building of the

Duquesne furnaces marks the beginning of the more recent interest in progress on this side, that has evolved greater records than were dreamed of when the Iron and Steel Institute visited us in 1890.

The London *Iron and Coal Trades Review*, referring to the auspices under which the 1904 visit was made, says that the whole world not only knows what American mechanical engineers have done, but to at least a part of it their achievements are an almost habitual nightmare. Alluding to the numerous visits made to this country in recent years by representatives of European iron and steel manufacturers, our contemporary says that this has been carried so far that there is danger that it has become a good deal of an infliction on the time and patience of manufacturers here. It adds that some English firms have not sought to investigate the methods of American works because they were not prepared to reciprocate such favors. It calls particular attention to Sheffield firms in this connection, few of whom were represented at the recent meeting in this country, and adds:

> It may at least be pointed out that until the Sheffield habit of mind has been greatly modified, the Iron and Steel Institute's claims to have broken down the exclusiveness and isolation that formerly distinguished the relations of manufacturers can hardly be fully justified.

There is no doubt that the failure of some British iron and steel manufacturers to admit American engineers to their works is responsible for the few instances in which American works were closed to the British visitors on the recent trip. While it was the rule, as Mr. Carnegie promised at the reception on the opening of the New York meeting, that all iron and steel plants were wide open to the visitors, there were just enough exceptions to emphasize the rule. When all is said about the amenities of such international meetings there remains at the bottom the fact that visitors on such occasions are moved to cross the water by the prospect of learning something that will be of direct advantage in the conduct of their business. To see the country is pleasant, and the vacation aspects of such a trip have their attractions, but the majority of engineers who came over in October had in mind finding out something that would help them to reduce the cost of their product. Americans are not slow to acknowledge their indebtedness to Great Britain for the foundation of their success in iron and steel manufacture, though the structure is largely of American rearing and design; and there has no doubt been the thought in connection with the invitations extended to the Iron and Steel Institute in 1890 and 1904 that if in this way any return could be made for what has been so freely drawn from British initiative and invention, the debt would gladly be paid. But where business advantage and international courtesy seem to conflict there can be no uncertainty as to which will give way. We have no doubt this point was fully appreciated by those who were recently our guests, for international competition is a serious business that will always take precedence of any performance of social courtesy.

It is significant, perhaps, of what some British iron manufacturers have had in their minds in this connection that the *Iron and Coal Trades Review*, in its issue of Nov. 11, devoted largely to the papers presented at the New York meeting of the Institute, should have spoken plainly on the attitude of British works managers toward foreign visitors. It prefaces these remarks by saying that the debt of the world to England in respect to the early foundations of the metallurgic art no doubt furnishes a large reason for the extreme cordiality of the reception accorded the Iron and Steel Institute, regarded as a purely British organization, in the iron-making countries it has visited in its career of 36 years. But it suggests that the time has come when the attentions of American, German and French engineers and steel manufacturers should be reciprocated. There have now been two visits to the United States, two to Germany and three to France. The *Review says*s

> The *entente cordiale* of Europe would be likely to be more effectively promoted if Great Britain were to show more zeal and readiness in reciprocating the attentions showed to her by other nations. Have we ever invited either the Americans, the Germans, or the French, as a manufacturing people, to become our guests *chez nous*, as they have invited us? Is it not understood in social life and in diplomacy that the acceptance of favors more or less implies reciprocity? And does not the absence of such reciprocity generally imply a disinclination to continue friendly relations? We do not suggest that in the present case anything of the kind has been either felt or shown of set purpose. But the facts are as they have been stated, and we believe that if ever the Iron and Steel Institute is to receive a foreign welcome in the future in any one of the three countries named, it must adopt a different attitude towards those who have hitherto only had the chance of acting as its hosts, and have yet to enjoy its hospitality.

There will be no little interest among American engineers in the statement which appears in the article from which we quote, to the effect that it is improbable that the Iron and Steel Institute can ever go again to the United States holding the same credentials to represent the iron trade of the world that it has hitherto held. It is pointed out by the writer that Great Britain now produces but one-fifth of the world's output of iron and one-sixth of the world's output of steel, whereas when the Institute was founded in 1868 that country produced more than half the world's output of those metals. It is added that the scepter of supremacy has passed absolutely to the United States, with the probability that this country will have an increasingly prominent place in iron and steel manufacture. To the question "Can Great Britain continue to enjoy the prestige of having within its border the largest of metallurgical societies?" the *Review* says that there is only one reply, and that the negative answer is made stronger by the fact that steps have recently been taken to found in the United States an institute on much the same lines.

Very little has been said publicly on this subject

in the United States. At the time of the first visit of the Iron and Steel Institute, 14 years ago, there was some talk of it, and the discussion was renewed in October when the British visitors were again with us. However, it can scarcely be said that the prediction of our London contemporary has any early probability of fulfillment. The American Institute of Mining Engineers has served as a vehicle for the advancement of the metallurgy of iron and steel through papers and discussions, and whatever gain may be conceived by some as likely to come to the metallurgical side of the iron industry by separation from the mining side would be more than offset by the serious losses involved in such a step. It would seem that any proposal in the direction suggested is less likely to be carried out now than at any time since it was mooted, particularly as the occupancy of the new building of the engineering societies will call for a concentration of strength and resources for the maintenance of the new scale of expense entailed upon all the participating societies.

The Labor Situation.

CITIZENS' INDUSTRIAL ASSOCIATION.

NEW YORK, Nov. 29.—The second annual convention of the Citizens' Industrial Association opened a two days' session at the new Hotel Astor today. President D. M. Parry in his address reviewed the movement in opposition to the excesses and lawlessness connected with the operations of some labor unions. Of the work of the association, he said in part:

"Those who have given any thought to the labor question must see that it is a very inadequate statement to say that it is merely a controversy between employers and employes. It is much more correct to say that the labor question is a conflict between two antagonistic and opposing systems of political economics. In reality, on the one side of this contest is the American system of government while on the other side is a mixture of socialism and despotism. What are the underlying principles at issue in labor strikes? The first and greatest is this: Has a man the right to work where he pleases, for whom he pleases, and when he pleases? Under the Constitution of this country he has such a right, and the laws of the country promise to guarantee him protection in the exercise of this right. In fact this right is the essence of American freedom. He who denies the possession by the individual of this right, which is declared to be an inalienable right, is in reality an enemy of our present form of government.

"Now what do the socialists and the trades unionists say in regard to this right of the individual workman? They say that he has no such right. They declare that the individual has no rights which a body of men or a majority may not ignore. Clarence Darrow, the retained attorney for strike organizations said in a recent article: Neither in law nor in morals is there any such thing as an inalienable right to work. * * * * The sacred right to work, so much paraded by certain people, means only the sacred right of the employer to hire cheap workmen to undermine good ones.

"Mr. John Mitchell does not come out publicly with such a bald expression of trades union belief as does Mr. Darrow, but he evades the issue with the subterfuge that union men have the right to refuse to work with non-union men. No one denies that in the absence of any contract men may quit work without giving any reason if they see fit. This is a simple deduction from the right of men to work where, when and for what they please. It is just as valid a right as is the right of the employer to discharge men without assigning cause. But when men once quit their employment they no longer have any claims on the jobs they have abandoned. They have no right to picket with the intent of injuring their former employer's business to coerce or intimidate or physically assault those who take their places.

"I do not believe that it is possible for the unions to form and maintain a monopoly in any labor industry for a long period of time, provided the laws against intimidation and slugging are enforced. Those who have attempted to corner commodities like wheat have found it a difficult and dangerous undertaking, but those who attempt to corner labor, which is composed of intelligent beings, will find that cornering wheat is child's play compared to what they are trying to do. So, for all practical purposes, the labor question does not resolve itself down to the proposition that union men have the right to refuse to work with non-union men, but rather to the proposition that when union men refuse to work with non-union men they have no right to interfere with or to prevent by threats or violence the non-union men from working.

"But, for the sake of argument, let us grant for a moment that it may be possible for a union to obtain such a monopoly over a trade that by refusing to work it may force the discharge of non-union men. Some cases have arisen in the courts involving the right of a labor monopoly to force the discharge of men merely because these men did not belong to the organization, and I believe the decisions are practically in accord in finding that where the refusal to work on the part of the union is for the sole purpose of working a malicious injury to workmen not in the organization, it constitutes illegal conspiracy on the part of the members of the union and that an injunction may be issued against a union to prevent it from such acts of persecution against non-union men. I am well aware that the decisions on this point are somewhat hazy and indefinite to the layman, but I am sure that where a organization quits work to compel the discharge of other men simply on the ground that these other men are not members of their organization, then those composing the organization are guilty of an act of persecution which cannot be justified on moral grounds no matter how much they may be acting within their legal rights.

"In this connection it can be said that the courts, with practical unanimity, have held that contracts between unions and employers which state that non-members of the union shall not be employed, are illegal and void, since such contracts tend to produce a monopoly, are against public policy and are also in conflict with the provisions of the Constitution guaranteeing individual rights. Therefore the closed shop cannot be maintained by means of contracts. Can it be maintained in the absence of contracts by the method of the unions refusing to work with non-union men? As I have pointed out, it could not be so maintained in practice for the very good reason that it is beyond the power of any organization to corner labor, and if proper protection is accorded the non-union men employed to take the places of the union men that quit work, then it is within the power of any class of employers, if they make up their minds to do it, to secure sufficient men outside of the union to do their work. But presuming that labor monopoly may become firmly established, then I believe that while men cannot and should not be compelled to work against their will, any concerted action on their part to quit work merely to prevent other men from exercising their right to labor should constitute an illegal conspiracy and should entitle those who are injured to some redress. The unions must also remember that while they have the right to quit work the employer has the right to employ whom he pleases, and this right of the employer is not to be taken from him no more than is the right to quit work to be taken from the employe. Another thing, the more the unions go on strike merely to force the discharge of non-union men the more the employers must co-

operate in the defense of the rights of independent labor and their own right to employ whom they please.

"That the principle of individual liberty is still more involved in this labor controversy than I have just indicated appears on a moment's consideration. The unions declare they have the right to restrict the number of apprentices, that is the number of men who shall have the opportunity of learning a trade. This is in direct conflict with the spirit of American institutions. Every man has the right in this country to learn any trade or profession he pleases and no organization has any moral or legal right to place obstacles in the way of men learning any honorable calling they may please to learn. Another thing: the unions assume the right of saying how long a man shall work and how much work he shall do in a day. Are these not clear infractions of the principle of individual liberty? Men vary in endurance and ability and no argument can be advanced which can in even a small degree justify the placing of limitations on the amount of work an individual may do. The individual is a better judge of his physical powers and of his capacity for work than any organization can possibly be. The world has jogged along a good many centuries without the race being deteriorated or decimated because of over work and there is no pressing need today for measures to prevent men from over exerting themselves. Under the working of the law of supply and demand the hours of labor have gradually declined from 16 and 14 to 10 and 9 in the last century and that without the assistance of organized labor."

One Thousand More "Open Shops."

Referring to conditions as they existed before Employers' Associations began to assert their rights the speaker said:

"I believe that this was a critical time in the history of our country and had the employers not abandoned the let-alone policy we should today be facing a very different condition of affairs from that now confronting us. We should, perhaps, have the eight-hour and anti-injunction bills on the statute books and the principle of preference to unionists in employment, or in other words, the national closed shop would more than likely be in a fair way of adoption. But, fortunately, for the welfare of every man, woman and child in this country, there sprang up a movement, which was practically spontaneous among the employers, for the formation of local associations, while such great organizations as the National Association of Manufacturers began to grapple with the problem with energy and determination. What happened? There is little need for me to rehearse the story. Strike after strike was ordered only to be lost by the unions, and a great check was given to trades union aggression from Maine to California. Shop after shop has been opened to the non-union man, and protection has been given him against the sluggers in most of our industrial centers.

"I believe that fully 1,000 manufacturing establishments have, in the last year, abandoned the closed shop and thrown their doors open to workmen without regard to their membership or non-membership in a union. I have been informed of the names of over 250 concerns in the city of Chicago alone that have done this. Is that not a record for the greatest hot-bed of unionism in the country? From all parts of the Central West I have received information of hundreds of other factories being opened to independent workmen. Many concerns in the East have also gone to the open shop, although I must say that the employers' movement is stronger in the Central West than it is here in the East and that the results show it. The effect of the open shop movement has been particularly beneficial. In some factories the output per man has been increased from 25 to 50 percent. Who can assert that this increase in output will not benefit the toiler as well as the employer? The theory that the less each man does the better off every one will be is one of the absurd doctrines of the union creed, and, if followed to its logical conclusion, would produce a state of society in which no one worked and every one went hungry and naked. If increasing the output per man worked injury to the workers then all machinery should be destroyed, for the effect of machinery is to multiply individual output.

"One of the most gratifying results of the employers' movement has been the remarkable change it has wrought in public opinion. In many parts of the country several years ago, the employer was forced to surrender to all kinds of demands from the walking delegates or else incur the obloquy of the community. Not so now. He finds he receives a ready hearing and if he is in the right he has but little trouble in obtaining the moral support of the public. I do not say this is true everywhere even now, but it is true in most cities and towns that have energetic local associations. To sum up, the formation of these various association in the Citizens' Industrial Association and those also that do not yet belong to this organization has resulted in incalculable benefit to the nation, and this benefit accrues not only to the employing classes but to labor as well. The principle of individual liberty for which these associations stand must be preserved in order that our industrial development and prosperity may continue.

"There may be among the employers of the country some who think that these associations have almost fulfilled their mission, that they have taught unionism a well deserved lesson and that having accomplished this end, there is no longer any pressing necessity for supporting the movement. If there are any such gentlemen they are to be classed among those who believe in the let-alone policy. It is true that these organizations have taught and are teaching organized labor a very important lesson. But this is not saying that organized labor has as yet taken its lesson very deeply to heart. If the unions are ready to alter their injurious practices and beliefs and will in the future forego their strenuous policy of force, then it is time that these employers' organizations were disbanded. But has any one noticed any particular evidence of a change of heart among the labor leaders? Are they not preaching more desperately than ever before their doctrine of the closed shop? Does not Mr. Gompers in his recent utterances make a point of appealing to his followers to 'grit their teeth and organize'? No, gentlemen, I do not see anything in the present situation that justifies in even a small degree any relaxation on the part of the general employers' movement. In fact I feel that the work inaugurated by these organizations has only been fairly started, and I venture the prediction that the events of the coming year will more than ever justify the wisdom shown by the employers in providing these associations as instruments for the defense of their rights. The maintenance of these organizations is, after all, inexpensive when you take into consideration the strike losses that are saved, and the gain that comes to industry through removing restriction on output and other handicaps which unionism seeks to place upon the employer." * * *

"During the last year the Citizens' Industrial Association and its constituent organizations have accomplished much in the line of education and the enlightenment of the public on the industrial problem and I hope to see this feature of its work greatly extended in the future. Not so much progress, however, is to be noted in the line of organization. The rapid formation of the associations of the year before and the political campaign without doubt operated against a large increase in new associations. It is well to remember, however, that sometimes it pays to make haste a little slowly and certainly no one should expect to find a great association springing at once into perfected shape. It has only been a year since this organization had its birth in a mass meeting held at Chicago, and those who were present on that occasion well remember the great differences of opinions that were expressed as to organization methods and policies. But I believe that the time has now arrived when we should have an

organization department with sufficient funds to carry out its purposes.

"In closing I wish to say that I have the utmost faith in the future of the Citizens' Industrial Association. The chief reason why this association will steadily develop in strength and influence is because it has a great work to perform—a work that must and will be performed. The organization has a genuine field of its own and as its purpose is of the highest importance it cannot fail constantly to attract new elements of strength. For an association only one year old it has certainly made marvelous progress. It contains today in its membership the principal local associations of the country as well as also a half dozen or more national organizations. This association now has a nucleus for a great national employers' federation and it is only a question of time when it will have on its rolls a great majority of the various associations in the country thus making it one of the most powerful and influential forces for good to be found in the world."

C. W. Post, of Battle Creek, Mich., spoke on "Industrial Peace." He referred to experiences in his own city and said that citizens there were now able to offer a guarantee of freedom from the evils of boycotts, strikes and lockouts and violent warfare between employers and employes, to manufacturers locating there.

CINCINNATI EMPLOYERS' DINNER.

Over 300 members of the Cincinnati Employers' Association were present at the first public dinner given last week by that organization. Each of the speakers dwelt on the necessity of the open shop. A. G. Pugh, president of the association, acted as toastmaster. Charles F. Waltz, secretary of the association, presented a report, the reading of which was frequently interrupted by applause. He emphatically declared for the open shop and told what had been accomplished by the association. In most emphatic terms he stated that lawbreakers would be brought to face the law for their misdeeds and that his association would prosecute the cases to the fullest extent. In closing he said: "We do not make war upon labor organizations; we do not desire to destroy unions, but to preserve them from themselves. The radical elements are in front and the conservatives in the background of the unions. We wish to see labor gets its fair share of industry and that capital is satisfied."

President Pugh stated in his address that the association waged no war against any body of men, but that it will not tolerate any slugging or boycotting. A. C. Marshall, of Dayton, secretary of the National Employers' Association, spoke on the "Benefits of Organization," and told of the work done at Dayton since the association's organization four years ago. H. J. Gosiger, president of the Eureka Foundry Co., spoke briefly of the present molders' strike. He said there was a time when Cincinnati was the greatest stove producing center of the United States, but conditions had changed because the Iron Molders' Union had driven the business out of the city. He said that the foundrymen had not yet won their fight and that the Employers' Association was rendering splendid service.

METAL TRADES ASSOCIATION NOTES.

CINCINNATI, Nov. 29.—The next annual convention of the National Metal Trades Association will be held in Chicago on March 23 and 24, 1905. Immediately preceding the convention there will be a meeting of the administrative council.

Upon recommendation of the finance committee of the N. M. T. A. the rate of assessment for the next quarter was fixed at 15 cents per month per operative receiving 20 cents per hour and 7½ cents per operative receiving less than 20 cents per hour.

The increase in membership in the N. M. T. A. since the adoption of the amendment to the constitution and by-laws decreasing the initiation fee to $25 and the reputation gained by the association's work in Chicago has been very gratifying to the officers.

W. C. Gentry, secretary of the Manufacturers Association of Pittsburg, reports 40 more men employed than discharged last week and that a decided improvement in business is in evidence in that city.

Robert Wuest, secretary of the N. M. T. A., left for St. Louis and Chicago Nov. 29., making a trip through Indiana and thence to Chicago.

The meeting of the St. Louis Metal Trades Association, held on Nov. 29, was addressed by W. P. Eagan, commissioner of the N. M. T. A. All of the struck foundries in St. Louis are running smoothly with full force and the labor situation is quiet throughout the city.

H. M. Leland, chairman of the Tenth District committee of the N. M. T. A. at Detroit, advised Commissioner Eagan that there was a likelihood of the association becoming involved in a strike of the polishers and buffers which may occur in Detroit this week. The commissioner called a meeting of the Tenth District committee and left for Detroit Nov. 27 to attend the meeting.

W. P. Snyder & Co., Acquire Mabel Furnace.

Negotiations for the purchase of the Mabel blast furnace located at Sharpsville, Pa., by W. P. Snyder & Co., of Pittsburg, were concluded this week and the plant will be taken over by the new management on May 1, 1905. This furnace is 75 x 15½ ft. and is equipped with four Pollock iron stoves. It has an annual capacity of foundry, malleable and Bessemer of 75,000 tons. The furnace was built in 1872 but was practically rebuilt in 1899. It was owned and operated by Perkins & Co., Ltd., M. A. Hanna & Co., of Cleveland, being the selling agents. The purchase of this plant gives W. P. Snyder & Co. the control of four merchant furnaces at Sharpsville, the output of the three furnaces of the Shenango Furnace Co. being sold by this concern, of which Mr. Snyder is president. The total annual capacity of the four furnaces is 275,000 tons. Only one of the three Shenango furnaces is now in operation, the remaining two undergoing extensive repairs. Stack No. 3 is being equipped with McClure fire brick stoves and will be ready to operate early in February. The other idle furnace will be blown in about Jan. 1.

The Mabel furnace was owned by a stock company composed of S. Perkins, Sharon; J. F. Rhodes, Boston; R. R. Rhodes, Cleveland; L. C. Hanna, Cleveland, and the M. A. Hanna estate. The Perkins and Rhodes interests desired to draw out, and as the other owners did not care to purchase all of the present stockholders decided to sell their stock.

The plant of the Ohio Steel Foundry Co., Paden City, W. Va., will be placed in operation shortly after the first of the year. The plant contains one roughing, one cold and three hot stands of rolls furnished by Mackintosh, Hemphill & Co., Pittsburg; two heating furnaces and an open-hearth furnace designed by J. E. Schlieper & Co., Allegheny, Pa. The power plant contains a boiler plant of 1,000 h. p. capacity and one 34 x 72 Hamilton Corliss engine. The contract for the installation of a 26-in. bar mill has been awarded to the Wheeling Mold & Foundry Co., Wheeling, W. Va. A galvanizing plant will also be built as well as an electric power plant. Three additional cranes of 15 tons capacity each will be installed next spring. J. E. Schlieper & Co., Allegheny, are the consulting engineers.

The cases connected with the strike of iron molders in Cincinnati were called Nov. 28, eight arrests having been made last week. Joseph F. Valentine, president of the Iron Molders' Union, of North America, charged with aiding and abetting in the destruction of property at the Eureka foundry, waived examination and was bound over to the grand jury and $2,000 bond. The grand jury meets next week. Valentine promptly renewed his bond for appearance at that time. He declared that he is absolutely innocent and that he waived examination in order to expedite the trial.

STEEL CORPORATION FURNACES RESUMING.

Blast furnaces E and F of the Edgar Thomson plant of the Carnegie Steel Co., located at Braddock, Pa., resumed operations this week after undergoing extensive repairs. With the blowing in of these stacks the entire Edgar Thomson plant is again in full operation for the first time in nearly a year. The Niles furnace of the Carnegie Steel Co. was blown in Wednesday after being out nearly eleven months. Extensive improvements have been made and the output has been materially increased. Last week one blast furnace at New Castle resumed operations and stack No. 3 at South Sharon. At present the Carnegie Steel Co. has 42 of its 51 furnaces in operation, the active producing capacity now being greater than at any previous time this year. At one period in the summer months only about half of the blast furnaces operated by the company were in operation. This year new furnaces have been completed at Youngstown, New Castle and Sharon, the plants at the two former places having two stacks, while at South Sharon there are three furnaces in the group. The Donora plant at Donora, Pa., with its two modern stacks, has never been operated and unless there is a further considerable increase in the demand there is no immediate prospect lighting these stacks. Furnace No. 3 of the Clairton Steel Co. was also completed this year, but the completion of this stack was not on the improvement program outlined by the United States Steel Corporation several years ago. The following furnaces of the Carnegie Steel Co. are idle: Columbus, 2; Donora, Pa., 2; Isabella, Pittsburg, 1; Mingo Junction, O., 1; Sharon, Pa., 1; Zanesville, O., 1; Clairton, Pa., 1. All of the furnaces of the National Tube Co. in the Pittsburg district are in operation and the Shoenberger stacks of the American Steel & Wire Co. continue to operate. The Edith and Neville Island furnaces of this company continued out, however, and there is no immediate prospect of blowing them in. Suits are threatened if operations are resumed on account of the alleged ore dust nuisance.

Clamshell Buckets in Lake Superior Mining.

Several million cubic yards of earth and other overburden will be removed from the Grant mine, Mesabi range, by Hoover & Mason of Chicago. This will be the first attempt on any proper scale, by experienced parties, to strip a Mesabi ore body by other machinery than the steam shovel. The firm will use clamshell buckets, somewhat similar to their ore loading devices, probably suspended from towers outside the mine, and they will strip and mine out portions of the property, using the mined-out parts for later depositing future stripping therein. The Grant is the property of the Jones & Laughlin Steel Co., of Pittsburg, and will probably be its chief Lake Superior mining property for some years. It is a state lease and contains a very large amount of ore of fair quality, chiefly non-Bessemer.

Ore Record of the "Bessemer" Road.

(Special Telegram.)

PITTSBURG, Nov. 30.—With yesterday's shipments the Bessemer & Lake Erie Railroad broke last year's haulage record of 4,379,179 net tons. In 1902, 4,685,045 tons were brought down and conditions are favorable to breaking this record, with the heavy shipments expected in December.

A Middlesbrough iron market report says that inquiries for No. 1 Cleveland pig iron were received in the second week in November for shipment to the United States in the first quarter of 1905, also for hematite (Bessemer) iron for the same delivery.

It is reported that the American Federation of Labor now in convention at San Francisco has assigned all stack work to the boiler makers.

The Eastern Machinery Market.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, NO. 150 NASSAU ST., NEW YORK, Nov. 29.

The condition of the machinery industry in this vicinity at the present time is the best of the year. During this month trade took a decided spurt for the better, and extensive inquiry fails to find a single machinery house whose stock of orders is not larger now than at the same time a month ago. The amount of new business placed during the past few weeks has been considerable, with every branch of the trade getting its share of it. Recent developments have been of such a cheerful character, that the universal opinion among machinery men is that we are on the eve of a return to the good times which prevailed in the trade prior to May, 1903, from which time many date the dullness which manifested itself up to within a few months ago. There are some who think that December is likely to show only a normal trade, in view of the usual yearly balances and stock taking among manufacturing interests, but everybody looks for a substantial increase in trade with the advent of the new year.

Inquiries received during the past month augur well for these expectations being realized, they being larger and more diversified than could be noted in some time. Buyers are showing a greater willingness to purchase machinery than they have at any time since the present year opened. The countless delays in closing that were in evidence a few months ago, are only met with rarely nowadays, buyers as a general rule giving their orders quickly. This is not only due to the fact that general business conditions are improving, but to prices stiffening. It is only a few months since the prospective buyer got everybody's price before ordering, thinking and in some cases discovering that it was to his advantage to do so, but now prices everywhere are so firmly held that little or nothing is gained by pursuing such a course.

Another convincing sign that the machinery trade has improved, is to be found in the activity which prevails in shops. Many of these are now running on full time, with a force of men already as large, if not as large, as they employed during the boom periods. Orders on hand are sufficient to keep the majority of machinery plants going in full blast for several months to come, and should trade increase as soon as expected, many shops will not have to wait long before they have enough orders booked to keep them employed for the greater part of the new year.

The present month has been a prosperous one for machine tool men. Comparatively few orders of great magnitude have been placed, but small orders have made their appearance so frequently as to make up excellent monthly totals. In some lines, notably lathes, this has been the case to an emphatic extent, but for the general run of machines there has been a very good demand also. Railroads have been small but constant buyers during the month, especially those which have had large specifications out, but it is not known definitely to what extent the latter have been encroached upon. Manufacturers have been steady purchasers of small lots also. From the standpoint of inquiries the month has been particularly good, and this fact forms one of the most hopeful signs of the future. Prices have been showing greater strength than at any time this year, and an exception to this statement does not exist. The belief is general that any quickening in the demand for machine tools, especially if coincident with any further increase in raw material, will bring about an early advance in prices. This was the keynote of discussion held at the meeting of the National Machine Tool Builders' Association in this city a fortnight ago, and it has found a ready response in trade circles here. Everything indicates that prices now are as low as they will be for some time to come. As for the railroad end of the machine tool trade, the recent orders given by companies for structural material and cars, and the reemployment of thousands of hands laid off in the early part

of the year, encourages the belief that they will soon take up the large amount of machinery they are known to need.

In engines and boilers an excellent trade developed during the past month. Orders for small horse power engines have been very good. Inquiries were more numerous than for the previous month, and orders are being given out with the least possible delay. Prices, which many times during the present year, were marked by irregularity, are now very strong. New business in sight is very gratifying, and this, together with recent improvement in trade, made some shops go on full time during the past few weeks. New building operations, calling for extensive power, are under way, the recent mild weather doing much to create the belief that new construction is not likely to be as much hindered by weather conditions during the balance of the winter, as was thought a month ago. Orders for boilers are still confined to small units, but come in pretty regularly.

Manufacturers of electrical equipment say their business has been very satisfactory during the past month, with small apparatus having the call as regards demand. The outlook for trade is regarded as very good. Prices show a strong tendency to harden and the day of concessions seems to have passed. New specifications are coming in nicely, and since election many have noticed less difficulty in closing.

In wood-working machinery and power transmitting machinery, conditions during the past month were of an improving character, and the volume of orders was considerably in advance of the October scale. Among manufacturers of machinists', contractors', engineers' and railway supplies, trade is reported to have made steady progress during the past few weeks.

The foreign demand for machinery in general was fairly good during the past month, specialties like pneumatic tools and appliances being especially well represented in the orders that were booked. The recent extensive purchases of American machine tools by the Japanese government has been the best advertisement that American manufacturers have had for their products abroad in some time, and they look for some excellent business from foreign sources in the future.

The Niles-Bement-Pond Co. booked considerable new business during the past month. An increased willingness among buyers to provide quickly for their requirements, is one of their experiences. The company feels that the trade is likely to witness a decided change for the better with the approach of the new year.

The Prentiss Tool & Supply Co. found the present month resulting in more orders than for the month previous. They say their inquiries were larger also.

Manning, Maxwell & Moore say their trade during the past month was steady, with orders coming in more frequently than October. Their crane department has been especially active recently, and some excellent orders have been booked.

Hill, Clarke & Co. declare they have no fault to find with recent business conditions, which they are sure are shaping themselves for much better times with the incoming of the new year.

The Van Dyck-Churchill Co. notes a slight improvement in its November trade over that done by it in October, with orders for small lots, at regular intervals, the feature.

James McCabe notes a better feeling in trade with the outlook more promising as the year draws to a close.

Paul Bigelow, representing the Buckeye Engine Co., booked more orders during the present month than he did in October. Among the most notable were one 450-h. p. cross compound engine, from the Cape May Real Estate Co., Cape May, N. J.; two 175-h. p. single engines, from the Otis Elevator Co., this city; one 110-h. p. tandem compound engine, from the Board of Public Service, St. Mary's, N. J.; and one 65-h. p. single engine, from the Connellsville Blower Co.

W. B. Mayo, of the Hoover-Owens-Rentschler Co., says his business for the present month was confined to orders for small horse power, and was very good. He is convinced that the outlook for business is much better than it has been.

The Crocker-Wheeler Co. had a very satisfactory November business, small equipment making up a large part of the orders it received. Inquiries were very good also, and they look for trade to take a start with the opening of the new year.

The American Wood Working Machinery Co. finds trade in that line to be looking up. It reports business to be coming in at an improving rate.

Thayer & Co., Inc., note business to be better in steam boilers with small units mostly in demand.

The A. & F. Brown Co., and the George V. Cresson Co. report trade in power transmitting machinery to be improving. Both companies booked some substantial orders during the past month.

Seamless Tube Co. of America.

Work on the erection of the new plant of the Seamless Tube Co. of America at Monessen, Pa., is progressing very favorably and it is probable that the first tubes will be rolled shortly after the first of the year. The buildings are nearly completed and most of the machinery, which is being shipped from Germany, is already on the ground. Seamless tubing will be manufactured according to the Briede patents, the American rights having been secured by this company. The process has been kept a secret but it is claimed that tubing can be manufactured for about half the cost of seamless tubing made by other processes. On the other hand, it cannot be made cheaply enough to compete on a price basis with the lap welded product. Only one heating is required in the rolling of the tube from the billet to the finished product. The round billet is heated and pierced with a mandrel and with its initial heat is rolled into the finished section. It is also possible to roll tapered tubing by this process. The Seamless Tube Co. of America is controlled by the same interests that operate the Pittsburg Steel Co. at Monessen. The steel for these two plants is purchased in the open market and amounts to close to 200,000 tons annually. It is probable that a Bessemer steel plant will be erected later with a capacity of 1,000 tons daily and it is also reported that two blast furnaces will be built. At present the company is securing its supply of steel from the Republic Iron & Steel Co., the contract having been entered into last summer at a very low price and calling for the delivery of 110,000 tons of Bessemer billets.

An interesting statement concerning the displacement of American tools in England appears in Sheffield, Eng., correspondence from which we take the following: "The most prosperous branch in connection with the steel trade is that having to do with the high speed qualities. Sheffield seems to have secured a very decided lead both in the home and foreign markets with this material, and there are firms in the city who are assiduously developing trade in the manufacture of tools from this steel. Until quite recently most of these tools came from America, but they are gradually being superseded by the home-made article, and some firms are contemplating competing in distant markets with their productions."

C. W. Jackson, formerly manager of the coke department of Rogers, Brown & Co., has organized the C. W. Jackson Coal & Coke Co., with capital stock of $25,000 fully subscribed, which will do a wholesale coal and coke business. The offices of the new firm will be located in Suite 300-304 Old Colony building, Chicago. Mr. Jackson's resignation took effect Nov. 30, instead of Dec. 31, as originally stated in this paper.

The International Harvester Co., Chicago, says that the report published in the daily press that its steel mill at South Deering, near Chicago, would shut down for two weeks is untrue. The mill is running full in all departments and will be continued so.

NEW SHOP BENCH ARRANGEMENT.

The recent addition to the plant of Warner & Swasey, Cleveland, has among other things worthy of note a bench scheme. This is illustrated in the two halftones. The drawers attached to the new benches are of cast iron. They are about 21 in. square and 7 in. deep. The engravings show the manner of their subdivision into compartments, etc., and there

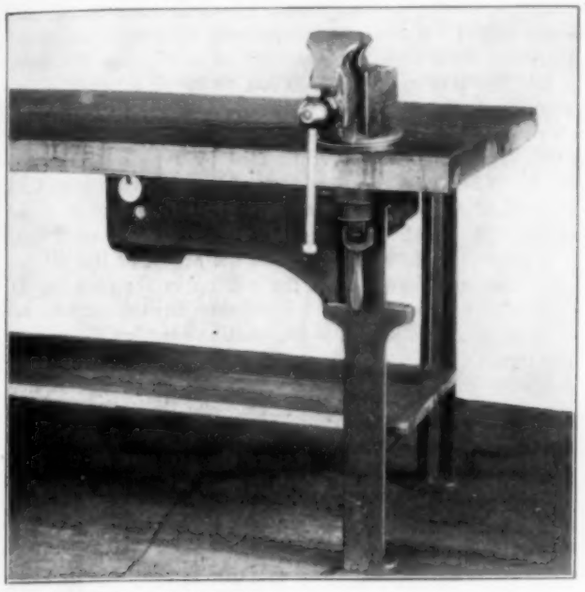


FIG. 1.—MACHINIST'S DRAWER LOCKED.

is a projecting rib at the lower front edge to serve as a handle. A couple of holes are drilled vertically through the lugs on the bench standard or leg and similar holes pass down and through the corner pieces in the drawer. A plain stud fits snugly in the holes in the drawer and forms a pivot in the lugs on which it swings easily. As will be seen, the bench leg has lugs on each side and the drawers are readily made either right or left handed and may then be used in pairs or singly as desired. They are fastened by a neat lock.

New Railway Equipment.

The addition of 5,000 freight cars to the equipment of the Pennsylvania lines west of Pittsburg, was provided for in a contract which the Pennsylvania Co. made public Nov. 25. A part of these cars will be built by the Standard Steel Car Co., of Pittsburg. The remainder will be built by the Cambria Steel Co. and the American Car & Foundry Co. The order makes a total of 11,800 cars ordered by the Pennsylvania for the coming year. The value of these cars will be approximately $10,000,000, even allowing for the lower price which cars are bringing now as compared with a year ago. The distinction between the order given last week and the one announced a few weeks ago is that the cars last ordered are for additional equipment, while the others are to replace wornout and damaged cars. In other words, with all old cars replaced, the Pennsylvania lines west of Pittsburg will have this next year 5,000 more cars than at any other time in their history and will be, therefore, the better equipped to handle the increasing business on the system.

Among other recent orders for new cars are the following: Guffey Petroleum Co., 30 tank cars of the Standard Steel Car Co.; Crossett Lumber Co., 50 logging cars, of the American Car & Foundry Co.; Escanaba & Lake Superior, 25 freight cars, of the American Car & Foundry Co.; the Rock Island railroad, 1,500 refrigerating cars, of the American Car & Foundry Co.; Rodger Ballast Car Co., 100 additional cars, of the American Car & Foundry Co.; Wisconsin Central, 500 box cars, of Haskell & Barker, in addition to the 200 recently ordered; the Grand Trunk, 100 box cars, of the Western Steel Car & Foundry Co.; Chicago, Burlington & Quincy, 1,000 cars, of the Pullman Co., in addition to the order for 1,000 recently placed; the Central of New Jersey, 1,000 double hopper-bottom steel gondolas of 80,000-lb. capacity, of the Standard Steel Car Co.; the Philadelphia & Reading, 65 passenger cars, of Harlan & Hollingsworth.

The Georgia railway has ordered three locomotives of the Baldwin Locomotive Works. The Japanese Government has ordered 15 additional locomotives of the same company. The Richmond, Fredericksburg & Potomac has ordered five locomotives of the American Locomotive Co. and the Buffalo, Rochester & Pittsburg has ordered five consolidation locomotives of the same company. The Chesapeake & Ohio has ordered eight 70-ton switch engines for use on the Cincinnati-Covington bridge, and 12 standard consolidation locomotives of the American Locomotive Co. The Harriman lines have ordered 100 locomotives of the Baldwin Locomotive Works. The Delaware, Lackawanna & Western has ordered 32 locomotives of the American Locomotive Co.

The Lake Superior Mining Institute will be invited to dedicate the memorials to be erected at the expense of William G. Mather, president of the Cleveland-Cliffs Iron Co., and Samuel Mitchell, of the Jackson Iron Co. to mark the first operations in the iron industry in Northern Michigan. One monument will be erected at the place where the first ore was discovered on the Marquette range and the other monument will be located at the site of the Jackson forge. The monuments will be pyramid in shape, 15 ft. high and 15 ft. at the base. They will be built of jasper, which capped the ore body at the Jackson mine. The jasper will be selected from piles near the place where the first ore was mined. The pyramids will be erected this fall if the plates arrive before the ground is covered with a heavy fall of snow. The old stack of the Pioneer furnace will be preserved and will

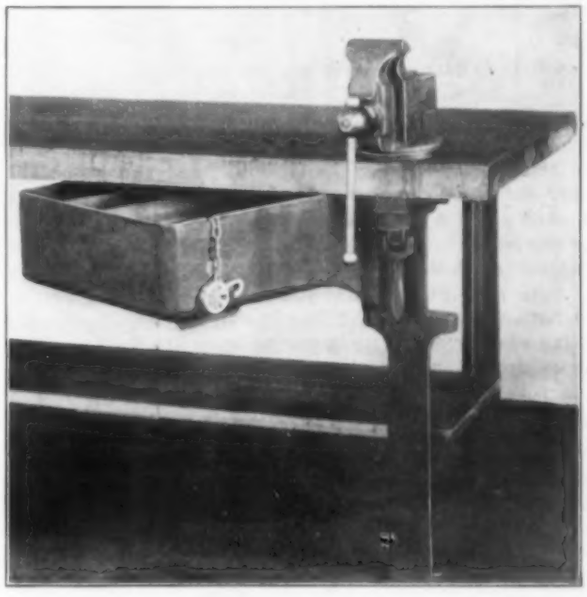


FIG. 2.—MACHINIST'S DRAWER OPEN.

also be marked with a plate, suitably inscribed. It is expected that the dedication will take place some time next summer, the exact time to be determined by the Institute.

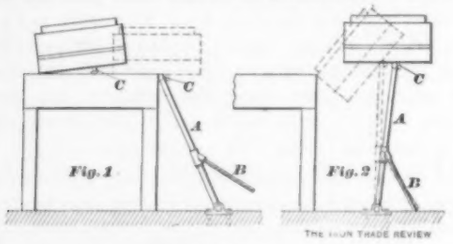
The Janney Mfg. Co., Ottumwa, Ia., capitalized at $125,000, has passed into the hands of a receiver. The company was engaged in the manufacture of farm implements and machinery.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

A Flask-turning Device.

A flask-turning device for the molder has been designed by John Magee of Malden, Mass., and Isaac W. Winchester of Chelsea, Mass. Mr. Magee is of the Magee Furnace Co., having offices at Boston and foundries at Chelsea, Mass., and in a recent letter he says: "The device is for use in connection with a power ramming machine where the bed of the machine is elevated above the floor. On this type of machine a man is greatly limited by his physical inability to handle a large number of flasks when they are of such a size as 22 by 22 in. Mainly on this account it has not been possible to get as good results with large work as with small and flasks as large as the one mentioned are seldom attempted with any degree of success on this type of machine. By using the device in front of the machine as shown in the patent, the molder is freed of all the weight of the flask while turning it over and he has a corresponding increase in production."

Fig. 1 is a side elevation of a rest embodying the invention and Fig. 2 is a similar view indicating the manner in which the flask is supported during the turning operation and is turned. The flask rest A is hinged to the floor and is made slightly higher than the top of the bench or the table of the machine as the case may be. The flask as shown in Fig. 1 has been filled above the pattern plate and the bottom



ANOTHER WAY OF ROLLING THE FLASK.

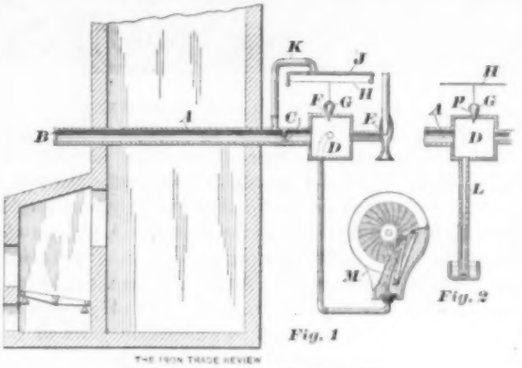
board let into the top ready for turning the flask in order to fill the other side. The flask rest is a bent rod comprising the rest proper, forming the cross bar, and two legs. The lower end of each leg is bent outward and fits into a bearing attached to the floor. The supporting legs have collars holding the rest D. The flask has pins or lugs C to answer the purpose indicated in dotted lines in Fig. 1 where the flask has been moved to one side and the lugs engage the further side of rest from the table and the flask is thereby hooked to the rest. The molder slides the flask along the table to the position shown in dotted lines in Fig. 1 and hooks the lugs over the cross bar. He next swings out the rest A as in Fig. 2 and allows the front end of the flask to assume the position seen in dotted lines in Fig. 2. Where the flask is light in weight the bottom may be without projection of any kind.

A Recording Pyrometer.

A recording pyrometer has been invented by Frank N. Speller of McKeesport, Pa. The patentee is metallurgist with the National Tube Co. and he states that a useful adaptation of the principle employed in the recording pyrometer here described has been applied by them to form an automatic recording calorimeter and that this latter instrument has been successfully in service on producer gas.

Fig. 1 shows a sectional diagram of the apparatus and Fig. 2 is a modified form of measuring device. The flue or furnace whose temperature is to be taken, has a tube A projecting into or through it. This tube has an orifice B opening to the air, and another opening C (about twice the diameter of B) connected by a tube to a suction chamber D in which a continuous suction is maintained by an injector E or any suitable means. A constant suction will be maintained in the tube A and draw a uniform quantity of air through the opening B. The suction chamber D has an opening to the air at F and the size of this orifice is varied by a valve G connected to a diaphragm at H. This diaphragm forms one wall of a suction regulating chamber connected by a pipe K with the tube A. The indicating device may be a manometer L, a tube with the lower end open and projecting into a vessel containing a liquid. This liquid will be forced by atmospheric pressure into the tube L and the height of the column in the tube will depend upon the suction in the chamber D. In place of this manometer an ordinary Bristol vacuum recorder M may be attached to the suction chamber C.

Assume that the tube A is now heated. There is a momentary change in pressure in the tube, causing the diaphragm of the regulator J to drop, closing the valve G. This throttling of the air opening causes an increased suction in the chamber D sufficient to restore the pressure in the tube A to the constant point at which it was set. This increased



PYROMETRY BY AIR PRESSURE.

suction in the chamber D causes a corresponding rise of the liquid in the manometer or a corresponding indication in the vacuum recorder. As the heat in the furnace decreases, the pressure in the tube A decreases and the diaphragm H lifts the valve G and the suction in the regulator D is decreased, a change which is practically instantaneous and promptly recorded.

The pressure in A compared with atmospheric pressure as a basis depends on the relative size of the orifices and the weight on the diaphragm of regulator J. The orifices are not necessarily small, so may be easily kept clean.

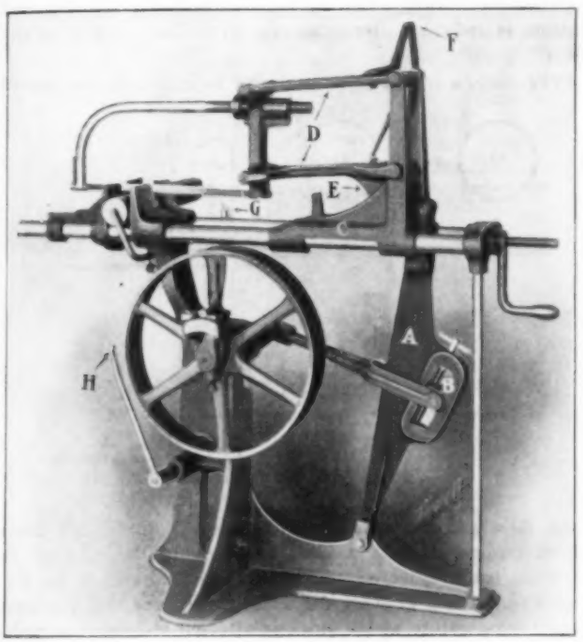
It is evident that under these conditions, a constant flow of air is maintained through B, which is expanded to the temperature to be measured and drawn out through C, with sufficient suction as indicated by manometer L to maintain a constant pressure in fire tube A.

The expansion of a constant volume of air being directly proportional to the increase in temperature and the suction required to remove this expanded air and maintain a constant pressure in fire tube A being proportional to the expansion of the air after it passes orifice B, it is evident that the suction at D must vary proportionally to temperature in tube A. The temperatures read after calibrating the instrument show the difference of temperature between outside air and pyrometer tube at A. If readings independent of the temperature of the outside air are desired and it is inconvenient to apply a correc-

tion obtained by taking the temperature of the outside air by an ordinary thermometer, the air before entering the tube A may be preheated by passing through a coil of steam pipe. The zero or basis of temperature-readings will then be 212 degrees Fahr. For ordinary purposes this refinement is unnecessary.

Hack Saw Machine.

A. W. Cash, mechanical engineer with the Fairbanks Co. of New York, has designed a power saw. As will be seen from the engraving this is a compact and self-contained machine. It takes saws from 9 to 14 in. long and will cut stock up to 5 in. diameter or 5 in. square. The success of the smaller machine has led the company to decide upon the manufacture of a larger size to cut stock to the dimensions of a 10-in. I-beam. The saw cuts on the backward or pulling stroke and the weight of saw frame and levers is raised during the forward or idle stroke of the blade. This keeps the saw sharp for a longer period than if it were dragging through the cut. A lever A is pivoted at the base of the frame. A crank pin on the driving shaft has a connecting rod coupled to a block B. The latter is adjustable in an inclined slot in the arm A. The slot allows of a change of stroke while the

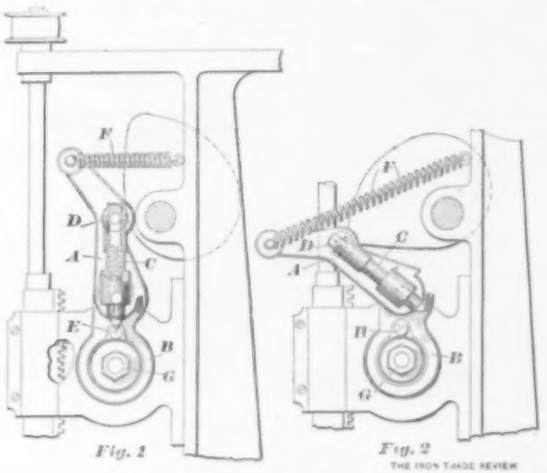


A NEW POWER HACK SAW.

machine is in motion and thus the full length of the blade may be utilized for effective work. The stroke can be varied from 6¼ to 8 in. to suit the work. The adjusting screw and the block B sliding at an angle to the center line of the lever A, always stop the rear end of the saw on the forward stroke at exactly the same point. The saw carriage C slides along the rods forming the upper part of the machine frame. The levers D and their connections form a parallel motion for the saw blade and the main lever is attached by a link, a bell crank lever E, to the lower parallel arm D. The movement of the main lever A in the one direction draws the saw blade in contact with the work and the reverse movement just as firmly lifts the saw in turn clear of the cut. There is an adjustable spring tension F which acts on the saw frame and gives the requisite pressure. A catch G is adapted to engage with a projection on the carriage and may be set to contact at any desired height. The rocking shaft to which it is fastened has a pawl H and when the catch or dog G strikes the descending carriage, the pawl engages the clutch lever and frees the driving pulley from the shaft. The driving clutch locks the crank to the pulley without end friction on the shaft bearings. The stop is found in practice to operate positively to within 1-32 in. from the point where it is desired to end the cut. The steel overhanging arm gives a constant tension to the blade and is arranged to facilitate the quick insertion of blades or changing for different lengths. It has means for adjusting the saw to cut squarely through stock even when the blade has more clearance or is duller on one side than the other.

Drill Press Construction.

Howard N. Hinckley of Hartford, Conn., has assigned to the Dwight Slate Machine Co. an improvement in drill presses. The design is especially for use in gang drilling machines where each spindle is driven from the same shaft, as by cams. This is a positive drive for the spindles and in case one is stopped by hard metal or any other cause while the power continues to be applied, a serious break in the mechanism may occur. The inventor introduces a breakdown arm to act as a safety valve. The breakdown arm is made up of two pieces, A and B, pivoted together. The upper part of A has a lug with a sleeve C containing a spring which presses out a pawl. A roller D is driven by the cam. A pin E on the lower member B has a groove engaged by the pawl and the breakdown arm is attached to a stationary part of the machine by the spring F. When the parts are in effective work-



A SAFETY DEVICE FOR GANG DRILLS.

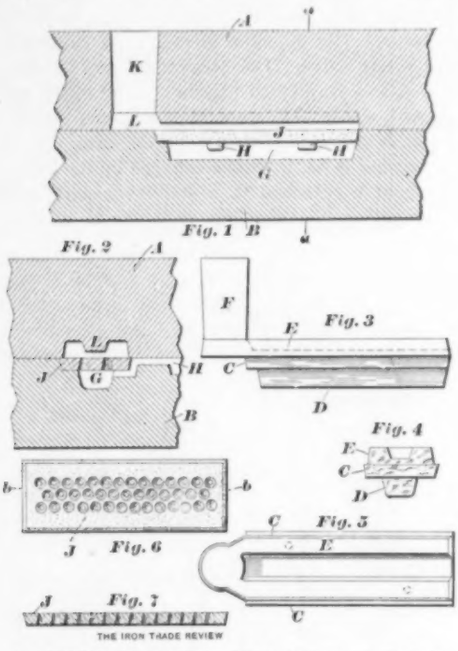
ing position they appear as in Fig. 1, the pressure of the spring in C being sufficient to transmit the power. If, however, a drill sticks until the resistance on the point is greater than the tension of the spring can withstand, the cam will force the part A over and free the spindle. The pinion shaft has a taper fit to the breakdown arm and by the nut G the spindle can be readily adjusted for a new drill or the wear of an old one.

A Skim Gate for Molds.

A skim gate and straining core has been patented by August Ladwig, of Milwaukee, Wis. Fig. 1 is a vertical section through a flask with this invention. Fig. 2 is a view taken at right angle to Fig. 1 on the line a-a. Fig. 3 is a side elevation of the drag, cope and ingate patterns in proper relation to each other, Fig. 4 is an end elevation with the ingate pattern removed, and Fig. 5 is a plan view. Fig. 6 is a plan view of the skim gate core and Fig. 7 is a sectional view taken on the line b-b of Fig. 6. A and B represent the cope and drag of a molder's flask. The drag pattern, Figs. 3, 4 and 5, has a flat core print C with beveled edges and a channel D, on the under side and having the sides and ends tapering toward the rounded bottom. The channel pattern D is narrower than the core print pattern and is shorter to form a shoulder. The cope pattern consists of a gate pattern E

with a projecting circular end having sloping sides to connect with the edges of the gate pattern and the two are secured by dowel pins. The ingate pattern F is of the usual shape. The patterns form a channel G in the sand of the drag having shoulders along the sides and at the end. The gate has a depending flange formed in the upper wall by the groove in the gate pattern. One or more gates H are formed in the drag leading from the channel D to the mold. A core, Fig. 6, of clay or oil sand, etc., has rows of perforations and fits on the seat as shown in Fig. 1 and 2. The gate H is suitably shaped to pass the core and is closed from the channel to the parting line by it.

When the flask is closed and metal passes through the ingate, it flows over the core J and into the openings to the channel G. The metal flowing to the gate faster than it passes through the perforations, rises in the gate and the



A METHOD OF MAKING SKIM GATES IN MOLDS.

slag rising on either side of the flange leaves only the pure metal to pass the openings in the core.

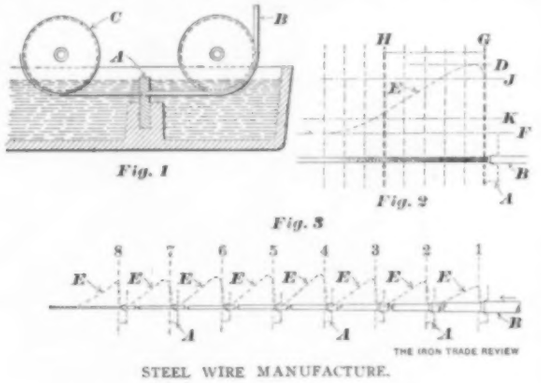
The Making of Steel Wire.

James A. Horton, of the Iroquois Machine Co., and a resident of Providence, R. I., has patented a process of making steel wire, particularly wire made from medium and high qualities of steel, especially as regards the proportion of carbon and resistant qualities of the metal. It is well known that in the manufacture of wire by the process of drawing steel with a high or medium proportion of carbon as distinguished from soft irons and steels low in carbon, the effect of the die upon the metal not only reduces the wire in diameter but tends to directly increase the density and hardness of the wire and in general to render the metal less ductile than it was before being drawn through the die. On this account it is difficult in practice to draw wire of the class mentioned from large to small diameters without resorting to annealing, heating the entire wire in special furnaces and then cooling the metal slowly. The main object of the present invention is a method of manufacture by which the wire may be reduced by drawing through a series of dies and at the same continuous operation by heating and cooling to reduce the hardening to an amount below what would result in permanent injury to the stock. At each of a series of stations the metal is drawn, heated and cooled for a similar treatment at every following stage in the process.

Fig. 1 illustrates a portion of a wire drawing apparatus in simple form. Fig. 2 is a diagram for further illustrating some of the phenomena which occur in connection with the reduction of the wire at a single drawing station. Fig. 3 is a similar but more extended diagram showing the operations taking place at the successive drawing stations in a series.

In Fig. 1, a die A of the usual type is supported on the frame of the machine between abutments so that it may be easily removed and replaced as occasion requires. The wire B is drawn into the die opening by any suitable means; Fig. 1 shows a drum C for this purpose. A number of dies can precede the final winding of the wire on the receiving drum. In Fig. 2 the wire B and the die A are illustrated on a larger scale. Here is a series of parallel lines with a diagram illustrative in a general way of the heating and cooling of the wire. When the wire is rapidly drawn into the die and is forcibly shaped anew it heats rapidly. This sudden heating of the wire is represented by an upward line on the diagram and the total amount of heat is shown by the height of the line D above the base line F. The frame of the machine seen in Fig. 1 contains liquid to some height above the wire B. The latter is therefore drawn through a cooling medium and it is evident that the lowering of the temperature of the wire will be performed much more quickly with the smaller wires and the inventor says that he has obtained exceptionally good results in reducing wire from No. 16 to Nos. 20 and 30 and finer.

The cooling of the wire is shown in Fig. 2 by the curved



STEEL WIRE MANUFACTURE.

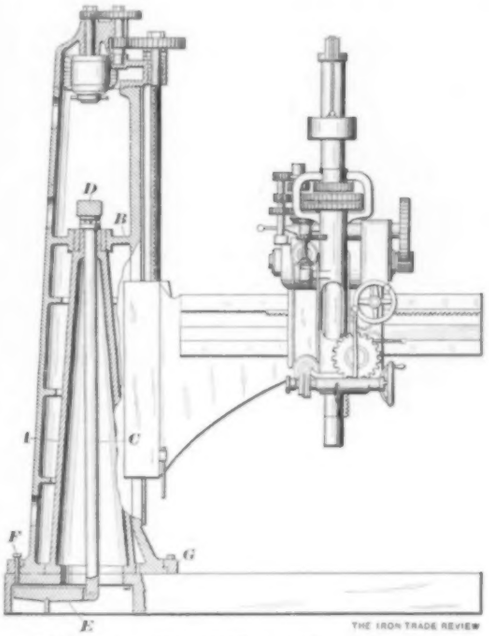
line E which descends from the line D to F, the latter point representing the complete cooling of the wire to its original temperature. A vertical line G is located at the forward side of the drawing die and it is believed that the maximum temperature in the stock is attained at about that point in the travel of the wire. Another vertical line, H, at some distance forward of the die indicates where the line E crosses a horizontal line K which shows in a general way by its height above the base line F the amount of heat remaining in the wire after the heating and cooling has progressed so far as to restore the stock approximately to the original physical condition and ready for the next series of operations. A horizontal line, J, is intended to show by its height above the line F an amount of heat sufficient to bring the wire to that state of ductility offsetting the hardening action of the die. By carrying out the drawing operation in this manner, having regard to the reduction at each drawing, the proportion of carbon in the wire, and the speed at which the wire is drawn through the die, the heating may be carried above the point illustrated by the line J and thus permit of conducting the wire directly to a succeeding drawing station and so on. For the illustration of the continuous feature, Fig. 3 shows a series of stations. It sometimes happens in practice that a quality of wire may be subjected to two successive drawings, as at stations 1 and 2, without accumulating the amount of physical change calling for annealing. The whole series of wire drawing operations may then be carried out at a speed to develop the heating of the wire above the

line J at the third station in the series, and this, the inventor, deems sufficiently early in the continuous process when using certain kinds of steel—such, for instance, as has a medium amount of ductility and a medium amount of carbon, the latter being, for instance, between forty and sixty or seventy points. If the wire originally has a greater amount of ductility, the first complete heating of the wire to a point above J may occur at a somewhat later point in the series—as, for instance, at station 4 or station 5 in Fig. 3. In this connection it may be noted that the speed of the wire at each succeeding station is higher than at a preceding station by an amount corresponding to the extension of the wire due to the reduction, at the later station of the series the speed will be many times higher than at where the reduction is begun.

The patentee says that "I find with steel of medium carbon—say 40 to 60 points—a speed increase of from fifty to one hundred percent over the speed ordinarily used in drawing wire from the same materials, with the usual reductions through dies in the open air in the old practice, will usually be sufficient to develop the necessary amount of wire-heating die action and that the lower speeds mentioned should be accompanied by such an amount of increase in reduction as to bring the amount of the treatment applied to the wire (considering the speed, reduction, and stability of the steel in any given case) up to approximately twice as much as would be considered desirable and proper under the old practice."

Radial Drill Improvement.

A recent improvement in radial drills consists in means for transferring to a bearing the weight of the column when

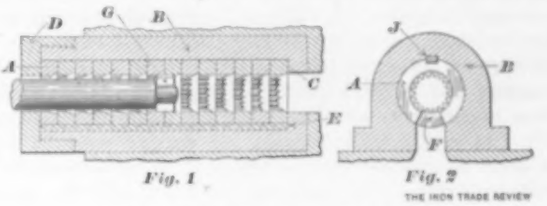


REMOVABLE BALL BEARINGS FOR THE COLUMN.

this is to be rotated. Charles E. Willey of Louisville, Ky., is the inventor and the design is illustrated by the elevation and partial section of a radial drill. In the particular construction here shown there is a motor mounted directly on the arm of the machine. The column encloses a stump A, the upper end fitting into a bearing in the flange B of the column. Within the stump is a central rod C carrying a ball bearing inserted between the end of the rod and a cross bar D of the column. At the lower end of the rod C is connected a pivoted arm E and there is a screw F to transfer the weight of the column to the rod C, the column being raised slightly from the bedplate by the upward motion of the rod. Turning the screw F in the other direction. the column is lowered to the bedplate and is then held in position by tightening the screws of the clamping ring G.

Cutting Teeth in Pinions, Sprockets, Etc.

The method of cutting gear teeth here described has been patented by Robert W. Smith of Stoneleigh, Redditch, England. Fig. 1 is a longitudinal section through the tool and Fig. 2 is a cross section of a similar tool and shows how



MAKING GEAR TEETH IN THE PRESS.

the chips are removed from the cutters. The patentee proposes to cut the teeth of a gear at the one operation. The tool consists of a number of hardened steel rings A within a casing B having at one end a retaining flange and at the other a screw cap D. The rings are cut on the inside to the appropriate tooth shape when acting in combination, commencing with shallow and broad cutting edges and gradually approaching the finished form at the other end of the tool. A key E is fixed in the casting B and holds the cutters in alignment. The blank G is forced through the tool by a reciprocating plunger. A portion of the rings may be cut away or recessed on the lower sides and a corresponding slot F provided in the under side of the casing to allow the chips to clear. This construction is shown in Fig. 2 and the retaining key is in this case placed at the top of the casing.

Excepting in a few departments, where repairs are being made, the entire plant of the Pennsylvania Steel Co., Steelton, Pa., is in operation and is likely to so continue. In the billet, blooming mill No. 1 and the rail mill, repairs are being made, which when completed will be followed by a resumption of business. Blast furnace No. 3, which has been out of commission for some time in order that it might be thoroughly repaired, is ready for blowing in and will soon be in operation. The open-hearth department has all it can do in filling orders. In the slab mill, great activity is shown. The bridge and construction department has been working to its capacity through all the dull period. Large contracts, notably that of the Blackwell's Island bridge, New York, with many lesser contracts, have kept the shops busy at all times.

A gold medal has been awarded to the Harrison Safety Boiler Works, Philadelphia, for their Cochrane feed water heaters and purifiers shown in the exhibit of the Philippine Government board at the Louisiana Purchase Exposition. Another gold medal has been awarded for the general exhibit of the Cochrane heaters, Sorge-Cochrane systems (for the thorough heating and purification of water for boiler feed and other purposes), and the Cochrane steam and oil separators.

George A. McKeel & Co., Ltd., Jackson, Mich., have added to their plant equipment a department which will be devoted exclusively to the manufacture of roller bearings for vehicles, automobiles, and shafting, having purchased from the Scheiffler Roller Bearing Co. all its machinery, patents, patterns, etc. McKeel & Co. have added largely to this equipment and will spare no expense to make this department up to date in every respect.

Creditors of the Diamond State Steel Co., Wilmington, Del., at a recent meeting decided to ask the federal court to dismiss the bankruptcy proceedings and appoint a general receiver. It is held that the company is not bankrupt, but cannot operate without a receiver to reorganize it.

THE MANUFACTURE OF MACHINES.

BY FRANK B. KLEINHANS.

Design of Machinery by Proportion.

The time consumed in the design of machinery is no small item of expense in comparison with the cost of building. This fact has often been overlooked in accepting an order for machinery, and as a result, much of the profit has thus been consumed in making the design and getting the drawings ready for the shop. A builder is frequently required to give an estimate on a machine which is either larger or smaller than anything that has been built. To lay out a machine to meet these requirements would consumer too much time and would run into considerable expense, yet designs must be made in order to compete for the business. It is commercial requirement rather than anything else which calls for quicker, easier methods. Some of the best things done in engineering were to meet these requirements; certain things had to be accomplished under difficult circumstances.

Let us take the lathe as a simple example. The builder is required to furnish a 36-in. lathe while the largest size to which he has access is 24-in. Fig. 1 shows the 24-in. machine.

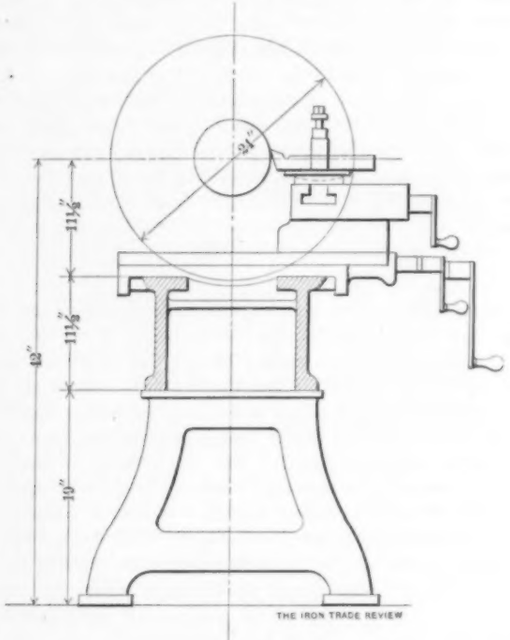


FIG. 1.

Suppose this lathe is drawn to the scale of 1½-in. to the foot. The 36-in. lathe would be larger than the 24-in. in proportion to the swing. The height of the bed, the width, the thickness of the metal, etc., would increase approximately in the same proportion. Of course the height from the floor to the center of the lathe would remain the same in each case. A few other changes would be necessary in order to fit the lathe for this swing. The proportion of increase would be in the ratio of 36 to 24 or 3 to 2. The scale of the 24-in. lathe is 1½ in. to one foot. If this scale was considered smaller in the proportion just mentioned, the dimensions of the 36-in. lathe could be taken from the drawing; thus, $1\frac{1}{2} \times \frac{2}{3} = 1$. Or if we consider this scale, 1 in. equals 1 foot, a good part of the drawing will represent the 36-in. lathe.

Fig. 2 shows the end view of the 36-in. lathe in the same proportion. The diameter of the face plate, the various dimensions of the bed, the thickness of the carriage, etc., are all obtained from the 24-in. lathe shown in Fig. 1. The height of the pedestal will be seen to be much less. This new design is readily obtained from the 24-in. lathe by placing a thin quality of transparent paper over the drawing and tracing off the principal parts. The minor changes will be drawn out to meet the different conditions. Thus on the 36-in. lathe, the top slide would be arranged with clamp bolts instead of the usual tool post and a rack R would also be necessary in order to keep the tail stock from creeping under the heavy work which a 36-in. lathe receives.

This new design would thus be obtained from an existing

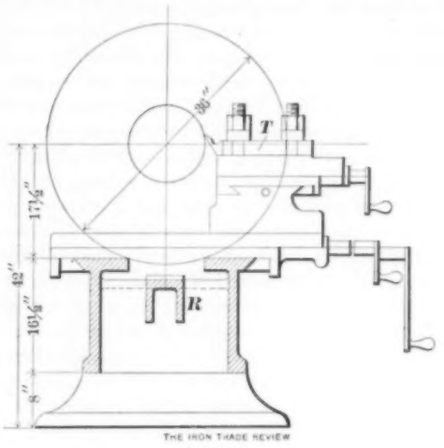


FIG. 2.

design in a comparatively short time and without much trouble. At the same time more uniformity in the design of different size machines can be obtained than would be possible if the designer adopted an independent method. There is scarcely any engineering work done which is not made in some proportion to something already accomplished and known to be satisfactory. One is therefore always on the safe side in designing in some fixed proportion to existing machines and, of course, making due allowance for the things which do not increase in the same proportion.

Fig. 3 represents a valve arrangement which is desired for a larger or smaller machine from the one for which this is fitted. The difference between this arrangement and the desired one is such that it would not be practical to represent it by the odd size scale which would be necessary. Let us say that this drawing is made half size, or 6 in. equals 1 ft., and we wish to increase in the proportion of 4 to 5. The new scale would therefore be $6 \times 4\text{-}5 = 4\ 4\text{-}5$ in. equal 1 ft. We therefore lay off on a piece of paper as shown in Fig. 4 a distance A = 4 4-5 in., we then divide this distance into 12 equal portions and lay off an extra part as shown at B. The latter being divided to represent an inch as shown. The paper is then trimmed along the outer edge. The scale would then be marked 4 4-5 in. equal 1 ft. With this scale, the various parts of the valve would be measured, which dimensions would

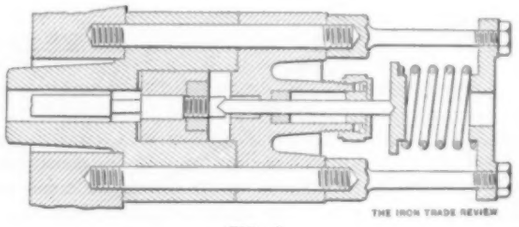


FIG. 3.

represent the size of the valve desired. With any other convenient scale, the new valve can be drawn from dimensions obtained with this new scale from the old valve. These scales can be made in a few minutes and give a fair proportion from an existing machine in a short time. In making these scales it is well to have a standard width and to make the scales with some similarity on the same kind of heavy drawing pa-

per. A complete set will soon be obtained and time saved by having the scale ready for use.

Overweights.

Every machine which is made heavier than the contract demands is built at just so much loss. There is a certain law that governs the cost of a machine. This law varies in proportion to the weight. As the weight increases, the size of the pattern, the amount of wood used in it and the labor expended upon it increases. This increase of weight follows all through the foundry, the core room, cupola, machine shop, erecting department, etc. Large machines are under contract before

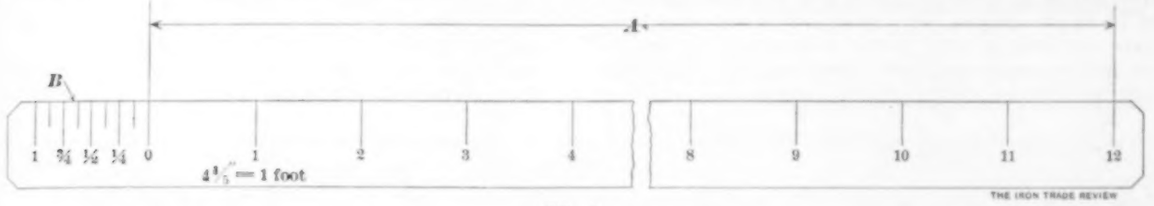


FIG. 4.

any part is built. The contract invariably specifies weight. Of course the understanding is to place various builders on the same footing and the customer may form a fair estimate of the relative values.

Let us say that we have a contract to build a forging press to weigh 350,000 lb. If the finished machine should weigh 15 percent more than this amount we would have an overweight of 52,500 lb. Assuming an average of 3 cents a pound for the extra material we would have $1,575 as the amount of money lost by excess weight. This is a considerable item in the total cost of the machine. This amount will offset the expense of new drawings, many new patterns and still leave a large margin. In nearly every case this overweight is brought about from the fact that the old drawings and old patterns are used in preference to going to the expense of making new ones. In another instance, the sales department may make a rash guess at the weight of the machine built from a standard design. Of course the price of the machine is based on the weight and runs over the figures by much too great an amount.

This difficulty can be guarded against; in the former case by ascertaining the amount of time required to make the change in the drafting room and various other departments

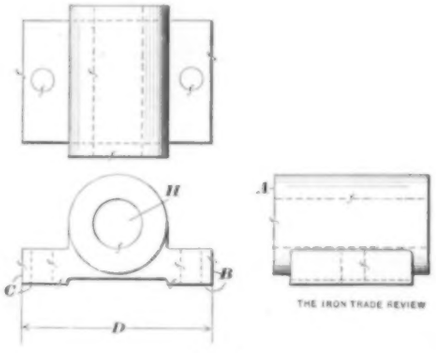


FIG. 5.

and comparing it with the amount saved. In the latter case, the sales department should be supplied with the actual weight of all machines built.

It is not always easy to obtain the weight of every piece upon a machine. Assuming that we wish to obtain the weight of the base plate of a large flanging press, this would probably weigh 80,000 or 90,000 lb. Such a casting is not readily picked up and placed upon the scales. We may have to wait for crane service or a chance to use the scales. Then after the casting is weighed there may not be a place to store it. There is a tendency therefore to evasion but this thing should be done and a complete record of the castings maintained. With a good handy, reliable record one is able to form a very close estimate of a new machine. The importance of estimating quickly on a job is felt more and more as time goes along It is a matter of almost daily occurrence that a concern is obliged to give a prompt estimate for the reason that the deal must be closed by a definite date.

One case of overweight was brought about in this way: After the contract had been signed, the customer specified that the machine which was a flanging press, should be capable of withstanding the full capacity upon the circle of two square feet in area, placed anywhere upon the table. All this was agreed to by the builders with the idea that this was nothing out of the ordinary. When the machine was gotten out by the engineering department, it was noticed that these conditions were severe and consequently the thickness of the metal had to be increased to meet the requirements. This necessitated an overweight of 20 percent, which was at the total loss of the builder and which did not make the machine any better for the customer. The fact of the matter is that it would be impossible to obtain a load in the manner mentioned. The dies are all large and always placed central with the main ram of the table. The stresses produced upon the various members under practical conditions are thus altogether different from the conditions set forth in the specifications. There are few cases where machines are under weight. This is carefully guarded against for the reason of a fear of having the machine thrown back on the builder's hands. If we were to regard questions of overweight as carefully as those of under weight, the profits would be found to be somewhat increased at the close of the year.

Machining Solid Bearings.

There are many places on machine tools where bearings must be provided for slow running shafts. As the wear is small, solid bearings are used to good advantage. These bearings must invariably be lined up so as to bring the gear centers, etc., in the proper relation. The best way of lining up

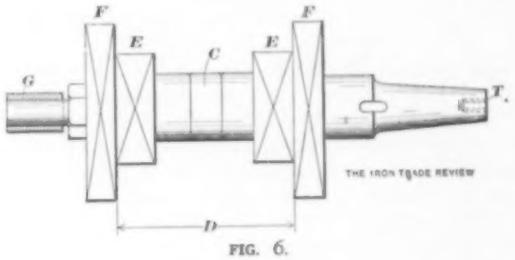


FIG. 6.

a bearing is to machine off a portion on either side of the pad just wide enough to allow the bearing to slip in.

Fig. 5 represents such a bearing. The hole H is to be bored and reamed to size and faced off on the side at A. This bearing must be machined along the bottom and on each side as shown at B and C. This is a medium size bearing and can be machined along the faces at B and C, on the milling machine. A gang cutter as shown at Fig. 6 will be arranged for this operation. The distance D is adjusted by the collar C

and paper washers to correspond with the dimensions D on Fig. 5. The cutters E and E mill off the lower side of the bearing, while the cutters F and F mill off the side. The end of the milling arbor G runs in a brass bushing and is supported by the arm of the milling machine. The arbor is drawn back into the spindle by T. Fig. 7 illustrates a cast iron jig for milling the bearing. The keys K and K are steel and fit the slots of the particular milling machine upon which the operation is to be performed. Slots S and S are pro-

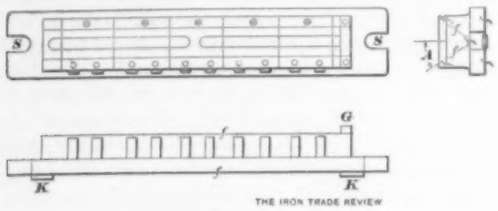


FIG. 7.

vided for bolting the jig to the table. The angle A is made equal to 30 degrees and the sides of the jig are machined as indicated by the finish marks.

A detail view of the arrangement of pins and screws is shown in Fig. 8. The bearing is dropped into place and the set screws S and T are adjusted to level the bearing. P is a spring pin. The spring A rests on the head of each pin and is attached to the jig by a round head screw. Once the set screws are adjusted they need not be changed except for wear which is lessened by case-hardening the tips. The bearing is now dropped into place, the clamp is set and its nut drawn down tight. The two spring pins P are pushed down until the bearing fits solid all around. The two tap bolts shown at B are then set up snug, and the castings are ready to be milled. The hardened tool steel gauge G, Fig. 3, is screwed to the end of the jigs. The table is adjusted to bring this gauge within the clearance of a paper of the milling cutter. The shape of the clamp is shown in Fig. 9. It is made from a wrought iron

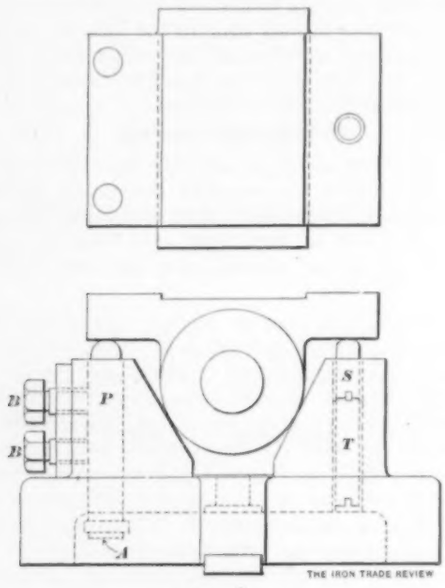


FIG. 8.

bar and is milled out on each end at an angle of 45 degrees to fit the casting. The hole H is drilled in the center for the clamp bolt B. A spring S supports the clamp. A pin P locks the casting in place. A slot T is milled through the center for moving the clamp bolt B.

A socket wrench is employed for setting up the work. The nut of the clamp bolt and the head of the tap bolt for the spring pins are made the same size to fit the opening in the wrench. The castings are slipped unto a simple drill jig and the two bolt holes are drilled. It is then ready to be bored out, reamed to size, and faced off on the outer edge. This is done in the lathe as illustrated in Fig. 10. B is the bearing, F is a fixture for supporting it and N is the nose of the lathe spindle. Two key studs are tapped into the fixture and

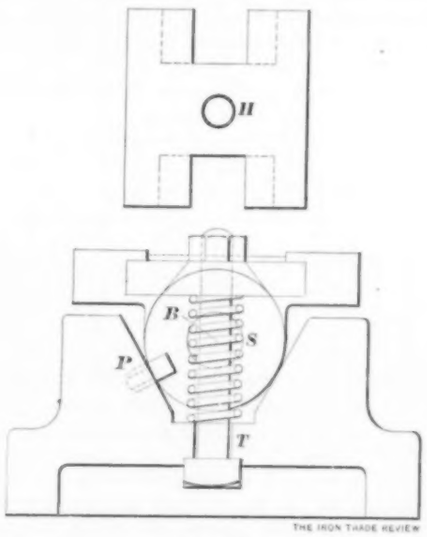


FIG. 9.

by means of keys K, the bearing is held. A fluted drill is now run through the rough cored hole H, the boring bar slipped through and given a bearing in the nose of the spindle. The hexagonal turret is fed up and the hole bored true. The turret is then thrown around and the hole brought to size by the reamer. After this a cutter is fed up against the stock and faces off the outer edge of the casting.

Another ship load of American made steel rails for use in the building of the Japanese military line in Korea was loaded for shipment at Tacoma on the British tramp steamer Quito, which arrived in port Nov. 10 from Yokohama. The Quito is chartered by a Japanese firm and her cargo will consist of rails, fish plates, spikes and other material used in railroad construction, the whole comprising about 5,000 tons

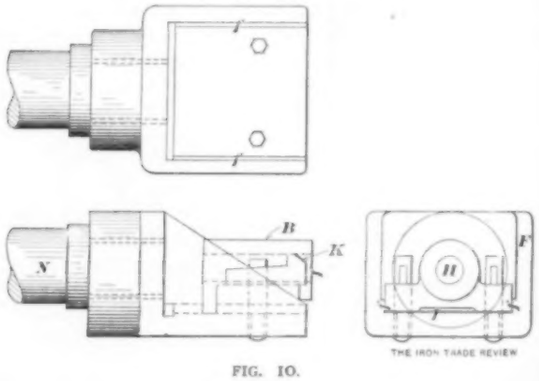


FIG. 10.

No attempt has been made to conceal the nature of the cargo or the destination, although the cargo is contraband of war and it is certain that Russian warships would seize it without question if they had the chance. There is no further fear of anything of this sort happening, however, as it is believed that any seaworthy ships that the Russians may have at Vladivostok are safely bottled up by winter weather.

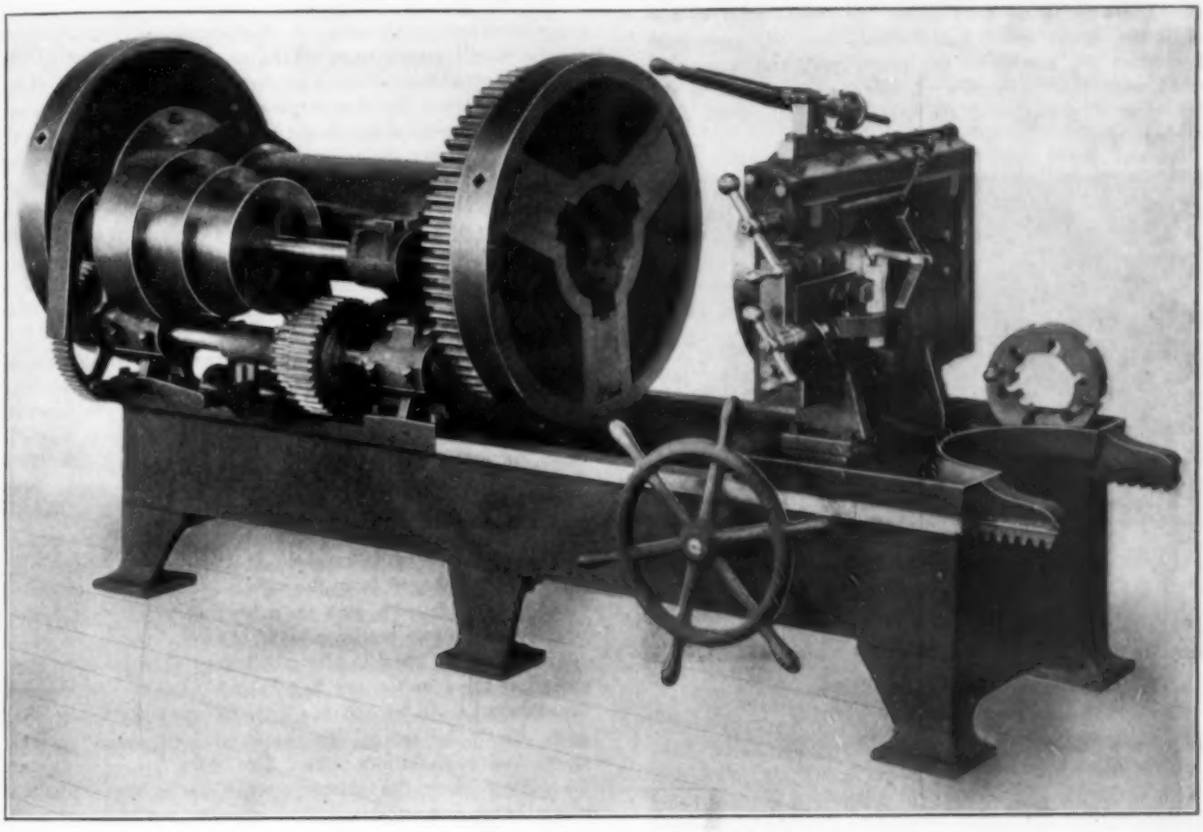
THREADING AND CUTTING-OFF MACHINE.

The improved threading and cutting-off machine built by the Bignall & Keeler Mfg. Co., of Edwardsville, Ill., takes pipe from 2½ to 8 in. Nine sets of dies are included in the regular equipment. The dies are 2 7-16 in. wide and quite suitable for extra heavy pipe, flanges, etc., such as are employed on ammonia work. The die head is substantial and is equipped with a simple adjusting mechanism. Duplicate threads of exact gauge can be obtained and the gauge may be varied by 1-1,000 in. All adjustments are made by hand and the dies are inserted in the head without removing any of the parts. The adjustments necessary to obtain threads of different gauges are made by turning the hand nut on the end of the screw. This nut is yoked to the bracket on the cam ring, and by turning it in either direction the ring is revolved and the dies expanded or contracted. As the thread in the nut is of small pitch, and the pitch of the cam is slight, an exceedingly small movement of the dies can be obtained, and when once the dies are adjusted the gauge cannot be altered except by turning the adjusting nut. The hand lever has a link connection to the cam ring and when lever and link are in a straight line the toggle joint securely locks everything in place.

The designers have recently changed the position of the cutting-off tool from the top of the die stand and put it down on the side on the steady slides. When the slides are brought into operation, the cutting-off tool moves up as the steady slides come against the pipe. The No. 8 machine here illustrated has a special reaming tool separate from the cutting-off tool. This reaming tool is swiveled and there is therefore no alteration of the cutting-off tool for reaming, the reaming tool simply swinging into place for cutting or back out of the way as may be required.

The gears are all machine cut from solid metal and of ample strength to sustain severe service. The chucks are massive and identical in design, each having three independent jaws operated by powerful screws. Tempered steel grips are dovetailed into the ends of the jaws; these can be readily removed and resharpened. As the jaws are graduated on the face they are easily set for any size of pipe. Special flange grippers are placed on the outside of the jaws of the rear chuck. They are found very convenient when making up flanges or flanged fittings.

An automatic oil pump is placed in the bed of the machine and the oil is delivered directly to the dies and cutting-off tool. The cone pulley has three steps, and by means of a compound shifting gear two speeds for the arbor can be obtained from each step of the pulley. The bearings are all of ample proportions, and well babbitted, and all wearing parts are large and accurately fitted. The countershaft pulleys are 16 in. diameter; two loose pulleys of 8-in. face; one tight pulley, 4-in. face; speed, 250 r. p. m. Weight of machine, 5,500 lb.; extreme floor space, 38 x 100 in.



IMPROVED PIPE THREADING AND CUTTING-OFF MACHINE.

The Vinton Colliery Co. has leased the coal property of the Lackawanna Coal & Coke Co., at Vintondale, near Clearfield, Pa. Under the terms of the lease the colliery company is compelled to mine 100,000 tons of coal annually. The Lackawanna Coal and Coke Co. is controlled by the Lackawanna Steel Co. and the property was leased for the reason that the coal mined was found unsatisfactory for coking in the company's by-product ovens at Buffalo.

The Antrim Iron Co., Mancelona, Mich., expects to blow in its Antrim furnace about Dec. 1. The charcoal kilns will be started and the Chemical Co.'s plant will resume operations.

The James Smart Mfg. Co., Brockville, Ontario, whose plant was destroyed by fire Nov. 16, expects to have its tool department running again within a few days.

EXHIBIT OF CAMERON STEAM PUMPS.

The display of the A. S. Cameron Steam Pump Works, of New York, in Machinery Hall, was awarded a gold medal at St. Louis. A number of pumps were also placed in actual service by the Exposition, forming a working exhibit and practically demonstrating their use. The various styles and sizes of working pumps exhibited will meet all ordinary and special requirements in mines, quarries, collieries, railroads, rolling mills, plantation irrigations and general pump service —while the sectional model also on exhibition was arranged with the steam end and water valve chest open to view, showing the simplicity of design and accessibility of the various parts. The Cameron pump has no outside valve gear or moving parts. The steam valve works in line with the piston without the intervention of arms or levers, enabling the pump to run without danger at a great speed, and without liability of injury should the suction pipe be lifted out of the water. There being no dead center the pumps start at any point of the stroke and run so slowly that the eye could hardly detect the motion of the piston rod, and were also operated with ease at a rate of speed unattainable in the duplex type of pump; and the public demonstrations were very interesting.

AN EXHIBIT AT ST. LOUIS.

Besides a number of regular patterns on exhibition there was a Cameron fuel oil pump and heater for use in connection with an oil burning system; the distinctive features being the by-pass valves and piping, to avoid, when desired, pumping oil through the heater. This is important as exhaust steam may be utilized to heat the oil to any degree necessary by using the by-pass in connection with it. There were also an oil line pump, for handling crude oil or a fine petroleum, a vertical boiler feed pump, a vertical deep well engine, several contractors' differential pumps and the vertical plunger and piston sinking pumps for mine service. Another type shown was a large pot valve pump, designed for mine station pumping and heavy service.

The Riter-Conley Mfg. Co., Pittsburg, has been awarded a large contract in Mexico which will require approximately 5,000 tons of plates and shapes to fill. The Mexican Light and Power Co. awarded this company the contract for furnishing the steel required in the erection of the Necaxa plant of that company, the building of the large steel penstocks, the construction of about 2,000 steel towers for the transmission lines and all the steel work for the sub-stations. When completed this will be the greatest electric power station in Mexico, the generating plant consisting of six turbines of 7,000 h. p. capacity each.

New Plant of the Jeanesville Iron Works Co. at Hazleton, Pa.

The Iron Trade Review has had occasional mention of the work done at the new plant of the Jeanesville Iron Works Co. at Hazleton, Pa. The plant has been designed by Dodge & Day, consulting engineers of Philadelphia, with the co-operation of Ballanger & Perot, architects. The Crocker-Wheeler system of multiple voltage is employed and this was fully elucidated in a comprehensive article on the plant of the Crocker-Wheeler Co., of Ampere, N. J., which appeared in *The Iron Trade Review* of April 7, 1904. The modernizing of the machine shop equipment of the new works at Hazleton and the speed regulation of the motor driven machinery there had an illustrated and characteristic example in the article descriptive of the patent assigned to the Crocker-Wheeler Co. by Mr. Gano S. Dunn. This article was in our issue of July 7, 1904, and gave several diagrams illustrative of the electrical connections and conditions. A chart represented the various spindle speeds on an engine lathe as they correspond to the several controller positions and change gears. Another chart in the article was for the purpose of determining the proper gearing ratio and voltage to obtain a given cutting speed with work of a given diameter. A halftone of a 60-in. lathe equipped with this system of speed regulation and in service at the Jeanesville Iron Works was also published. Mr. Day, in a discussion at the Franklin Institute, recently reported in the *Journal*, has treated the motor drives of the machine tools at the Hazleton plant in some detail. On this account there is little now to be said of the machine shop, but some particulars of the balance of the plant may be of interest.

In 1852, James H. Haydon commenced the manufacture of mine pumps at Jeanesville, Pa. The company has prospered and the management of the plant has long felt the need of newer and larger quarters. Some two years ago it was decided to erect a plant at Hazleton, Pa., and Dodge & Day were commissioned to engineer the equipment. Within a year from the signing of contracts, the new plant was in full operation. Reinforced concrete was the principal material of construction.

The raw material is received at the plant on a railroad siding. It is dumped from the cars into receiving bins and is carried to the foundry over an industrial railway. It is then raised to the cupola platform by an electric elevator.

The new plant consists of six buildings. The main building comprises the foundry, 107 ft. by 192 ft.; the casting cleaning department, 41 ft. by 160 ft.; and the machine and erecting shop, 304 ft. by 107 ft. In the latter is a room for small stores and a blacksmith shop. The other five buildings are the pattern shop, the pattern storage house, the offices, the power house and a stable.

The casting cleaning department, which bisects the main building, is separated from the foundry and machine shop by two fire walls extending above the roof. The eastern end of the main building is of temporary construction to permit of longitudinal extension. As the flask storage is at the western end of the plant, directly beyond the foundry, this end of the latter building is also not of permanent construction; thus, not only permitting of future extension, but also allowing the 20-ton electric crane to pass in and out with its load. This end of the foundry building is provided with large rolling steel shutters.

Due consideration was given to the location of the various buildings from the standpoint of the fire risk and that one building might not interfere with the natural lighting of another. The entire side of the pattern storage building facing the foundry is a solid wall without windows. The ground occupied required considerable grading, but the rock which was excavated was highly suitable for crushing to use in the concrete from which the buildings were constructed.

The engineers chose as the motive power, direct current electricity. With the exception of several pneumatic, ground-

operated traveling cranes in the casting cleaning department, all the machinery in the shops is electrically driven. A 300-h. p. De Laval turbine, connected to two 100-k. w. Crocker-Wheeler generators, furnishes power for the entire plant at the present time. In the near future, another unit of the same size is to be installed. Multiple voltage for obtaining the desired speed regulation throughout the shops is obtained by the introduction of a type D Crocker-Wheeler balancer set, consisting of three units—40, 80 and 120 volts—each of these voltages being controlled by three field regulators.

The adoption of a turbine without a condenser was governed by several important factors, not the least of which is the low cost of the steam generated, due to the fact that coal in the locality is obtained at about 90 cents per ton. In the engine room there is also a 12 x 18 x 12 x 12 Ingersoll-Sergeant class H air-compressor supplying air to the traveling cranes in the casting cleaning department, jib cranes in the foundry, and the various pneumatic tools. Between the engine and the boiler rooms are located the artesian well pump, the boiler feed pump, the vacuum pump, the feedwater heater and a 1,000-gallon underwriter's fire pump, which receives its supply from a 200,000-gallon reservoir. The means of fighting fire consist of fire plugs and hose lines located about the premises. The clinkers from the boilers are thrown on a grating over an elevator boot located in the boiler house and are broken to the proper size, dropped through the openings and into buckets of a steel-encased elevator, made by the Link Belt Engineering Co., of Nicetown, Pa., whence they are carried to a cylindrical receiving bin of 5-tons capacity. They are dumped into trucks through a gate in the bottom of the bin and carted away.

The foundry has a cylinder pit, 12 ft. in diameter and 9 ft. deep. The plunger pit, which forms a third of a circle, 28 ft. outside diameter and 20 ft. inside, 4 ft. wide by 6 ft. deep, adjoins the cylinder pit. The weight pit is 13 ft. 4 in. wide and 5 ft. deep. These pits are served by individual jib cranes operated pneumatically. In the right hand bay are located a cupola, four core ovens, the blower room, molding department for small castings, sand bins and sifters. The cupola is of 12-14 tons melting capacity per hour. Another similar unit is now being installed. The charging platform is served by a 2-ton electrically driven elevator provided with automatic stops at the top and bottom of the lift. There are two ladles of 8,000 and 10,000 pounds capacity respectively with numerous smaller ladles. Every provision has been made for rapid economic handling of the material and ladles throughout the foundry. The casting cleaning department is served by two 10-ton, floor operated pneumatic traveling cranes running its full length.

The interior arrangement and layout of the machine shop, with the absence of shafting, belts and other overhead obstructions are in marked contrast to the old-time shop. A generous area of glass in the windows and roof affords a uniform distribution of natural light. The floors are entirely unobstructed by anything that will interfere with the free use of the valuable floor space. At the north end of the shop is the erecting space where also each pump is tested to far above its rated capacity before being shipped from the plant on the railroad cars which come directly into this part of the shop.

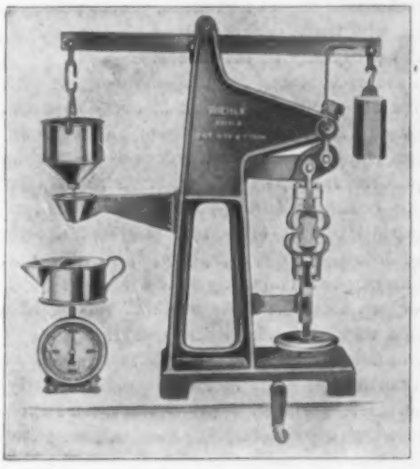
Large new steel freight cars have just been adopted for service on the Great Central railway of England, replacing the former small, frail and low capacity cars. The cars are built entirely of steel and will carry a load of 89,600 pounds, or 40 long tons, as a minimum.

The Janesville Barb Wire Works, Janesville, Wis., are now very busy, contrary to the usual condition at this time of the year. Twenty new machines for making square mesh woven wire fencing have been purchased and will be installed.

IMPROVED CEMENT-TESTING MACHINE.

A recent patent covers an improvement of the standard cement testing machines made by Riehlé & Bros. Testing Machine Co., of Philadelphia. The illustration shows the Riehlé United States standard 1,000-lb. automatic cement tester. The machine is made entirely of metal. The beam is brought to a balance by pouring shot into the cone-shaped bucket on the left of the machine, thus counterbalancing the weight on the right hand side. The test briquette is then placed in the grips and by means of the hand wheel under the lower grip the slack is taken up. A newly designed pistqn valve in the bucket is then lifted and the shot flows out of the bucket, causing the weight to overbalance the bucket and the load to be thus applied to the specimen under test. When a sufficient quantity of the shot has fallen from the bucket, the unbalanced force of the weight is sufficient to break the briquette and then the lightened bucket is jarred by the weight and the piston valve in it closed, stopping the flow of shot.

The weight of the shot passing into the receiver is a measure of the force required to break the briquette. This shot is caught in a scoop resting on a scale graduated to read directly the stress on the briquette. If at any time the briquette should be so yielding as to allow the beam to strike the lower buffer before the briquette is broken, the valve closes automatically



A NEW TESTING MACHINE.

and the flow of shot ceases. Then if the operator so desires, the beam can be raised by the worm and wheel and the test continued. Should it be desired to make a test of extreme accuracy the beam may be kept horizontal during the investigation, by means of the crank and worm wheel. Any form of scale may be used in place of the spring balance. The solid back grip is also a new design suggested by the complaints received to the effect that the grips spread during the testing process. The spreading caused the conditions to vary materially and results to be correspondingly inaccurate. The grips are made amply strong to prevent any springing.

The above described mechanical operation applies to both sizes of automatic cement testers made by the company. The weight of shot in the 1,000-lb. machine is designed for a ratio of 1 to 100; 10 lb. of shot on an ordinary scale indicates a strain of 1,000 lb. In the 2,000-lb. machine the proportion is as 1 to 80, 25 lb. of shot indicating 2,000-lb. strain.

The Taylor & Lowell Mfg. Co., Janesville, Wis., is now located in its new building on North River street, and the gasoline engine department is in operation. The manufacture of gasoline engines is a new line of work for this company. It will begin with the manufacture of machines of one, two, four and six horse power and as the demand increases larger engines will be constructed.

Cleveland Machinery Market.

OFFICE OF *The Iron Trade Review.*
1064 ROSE BUILDING, November 29.

The improvement in business, first noticed in a marked degree in pig iron and later in finished materials, is now being felt among makers of machine tools and other manufacturers. While this change has not resulted in large orders in all cases, there is a distinctly better feeling which promises to lead to increased business.

As usual, makers of castings are having trouble in advancing their prices in accordance with the advances in prices of material which they use. The Cleveland Steel Casting Co. finds that the increase in costs tends to check the buying of steel castings. Its refusal to sell at old rates is taken as accounting for the fact that the company has not as much to do this month as it did last. It hopes, however, that in the near future business will pick up.

The Cleveland Elevator Bucket Co., which is an exception to the rule, sees nothing very flattering in sight in its line, although several large elevators for grain service are being talked of in Canada and one or two in the United States. These have not yet materialized.

From the point of view of the Elwell-Parker Electric Co. business has improved distinctly of late and the outlook is excellent. Its opinion is that the next two or three years will be good ones. It sees no reason, judging from the present indications, why there should not be a considerable period of activity and prosperity in this country.

The Chisholm & Moore Mfg. Co. notes great activity in its trade. "We are running very full in every department," says the company. "As regards our hoist business, we have recently taken a number of large orders and are obliged to increase our force very materially in order to keep up with our trade. This condition also applies to our foundry. We have looked forward to this revival of busy times following the election of Roosevelt. We did not, however, expect that it would strike us quite as quickly as it has."

The Macbeth Iron Co. finds business very good and looks forward to a very busy winter and spring.

The Acme Machinery Co. considers that on the whole trade is better than it was. The number of inquiries may not have greatly increased, but there appears a decided improvement in the way in which customers place their orders. They seem to be more hopeful and readier to place orders than for the past few months.

The Van Dorn & Dutton Co. reports a very satisfactory increase both in orders and inquiries the last month. The company says the indications seem fair for a prosperous year during 1905.

The Cleveland Automatic Machine Co. makes the following cheerful report: "For the last four months we have been extremely busy, operating our factory full handed. Up to this time in the above period we have had more orders than we have been able to take care of. At present our men on the road state there is a slight dullness that is coming on toward the new year, but our anticipated business is excellent. The facts are we have no reason to complain in any sense of the word. We are quite satisfied that the last election would mean a continuation of good times, as everybody seems to be satisfied—even the Democrats—the way the election went. As far as we are concerned, everything seems prosperous."

The Cleveland Pneumatic Tool Co. states that there is more stir in its line than for some time, and a good many inquiries which show that people are getting ready to start up full swing again. The company feels that it has had far more than its share of the pneumatic tool trade in the past year.

The Brown Hoisting Machinery Co. believes that, from all indications, the future in its line of business will be bright.

The Upson Nut Co. finds considerable improvement in demand and inquiry for its products, and notes that business seems to be coming forward in a very satisfactory manner. This company is confidently expecting a busy season.

The Cleveland Twist Drill Co. has found considerable improvement in its line of business, and believes at the present time that the outlook for next year is good.

The demand for the products of the Cleveland Steel Co. has greatly increased of late so that the plant is crowded with business. The indications are that the increased demand will be steady, and the company looks for an unusual winter trade.

The Avery Stamping Co. does anything in the line of heavy pressed metal work. At the present time it finds business very good and the outlook much brighter.

The Cleveland Punch & Shear Works Co. has noticed considerable improvement. The inquiries that are coming in seem to be much more alive than those received for the last six months; inquiries also being for larger equipment, and in some cases for six or eight machines.

The Reliance Gauge Column Co. reports that in the last 30 or 60 days it has noticed an increased demand for its product, and considerably more orders from all parts of the country, than in the previous 60 days. This increase has been very satisfactory, as it seems to have come from all sections of the country.

The Brightman Furnace Co., manufacturer of the Brightman mechanical stoker, reports business good. It has made recent sales as follows: Pennsylvania Paraffine Works, Titusville, Pa., five stokers; Canton Light, Heat & Power Co., Canton, O., four stokers, third order; National Distilling Co., Milwaukee, seven stokers, second order; Evansville Electric Railway, Evansville, Ind., four stokers, second order; the Crystal Ice Mfg. & Cold Storage Co., Columbus, O., ten stokers. Aside from equipping steam boilers with Brightman stokers, the company has been supplying stokers for various drying apparatus for distilleries, brick yards, coal and cement works.

The Cleveland Crane & Car Co. reports that business for the last two or three months has been much better than during the first part of the year, and is steadily improving.

The Snider-Hughes Co. now has all the work it can take care of and the indications are that there will be a decided improvement in trade in its line, that of pumping machinery.

The Ajax Mfg. Co. reports that the outlook for business in its line is very bright. It manufactures upsetting and forging machines, bolt and rivet headers, hot pressed nut machines, bulldozers, forging rolls, etc.

The Standard Welding Co. is enjoying good business, which is the most conservative that it has had in the past two years. Buyers seem to be willing to pay just a little more for better goods, and while they are not buying for the future, yet for the present they are entering very nice orders. The company has no cause for complaint and believes that the future will be a vast improvement over the past 24 months.

The C. O. Bartlett & Snow Co. reports an interesting condition as influenced by the crops. President Bartlett says: "The last three weeks will hardly justify us in stating any decided improvement in the demand for our different kinds of machinery. We feel, however, that the coming year will be a good one for all manufacturers. Do not expect to see very much higher prices in iron, $16 a ton for pig iron is enough. It will give good profits, and we believe that the manufacturers of pig iron will be satisfied with good fair profits. Collections seem to be quite a little better. The scarcity of corn in Ohio, Indiana, Pennsylvania and New York naturally affects our mill business to some extent; also the scarcity of wheat throughout the whole country affects us to some extent. Very few of the flour mills in the central or eastern states will be able to run their mills on home grown wheat, and to import it from the far west means a loss. The result is that the flour mills all over this part of the country will be idle at least part of the time."

The National Acme Mfg. Co. reports an unmistakable im-

provement in its business for November. This could not consistently have been said for several preceding months. Since election inquiries have been much more numerous, sales have also been in excess of the corresponding month last year, and the prospects are certainly much brighter than they have been for over a year.

The Cleveland City Forge & Iron Co. wishes that it had good reason to be satisfied with the present state of things. The fact is, however, it states, that it is far from being busy in its regular lines, and while the plant is at present doing fairly well in the way of specialties and general railroad work, there is great room for improvement, and so far as the general forging business is concerned, there is anything but a satisfactory or encouraging outlook.

HEAVY DUTY ENGINES IN STEEL PLANTS.*

BY ARTHUR L. STRICKLAND.

In taking up the subject of heavy duty engine service in a modern steel plant, it will be necessary to briefly describe the exterior process of manufacturing Bessemer steel.

When the molten iron comes from the cupolas and is turned into the converters, the heavy duty engine service in the steel plant begins. The engine used in this connection is known to steel men as the Bessemer blowing engine. The engine in the plant where the writer is employed is a vertical cross compound Corliss with steam cylinders 46 and 88 x 60 in., and 79-in. blowing tubs. It measures 65 ft. from the floor to the top of the blowing tubs. The air inlet valves are of the Kennedy type while the discharge valves are of the Reynolds pattern. This engine runs at a very moderate speed, and to the writer's knowledge it has never been known to exceed 36 revolutions per minute. At this speed we can maintain a constant air pressure of 25 lb. per sq. in. under 10 tons of iron.

The engine is equipped with a gravity oiling system planned and installed by the writer. A brief description of this system may be of interest. The oil used on the entire engine is drained into the crank pits and drip pans under the eccentrics from which it runs to a filter located in the basement. After passing through the filter, the oil is drawn into a supply tank and from this tank it is pumped, by the means of a small duplex steam pump located on the ground floor where the engineer can give it the required attention, to a distributing tank located a little above the top of the engine. From there it gravitates to all parts of the engine. We have found this system to be very satisfactory and economical. We are using 1 gallon of fresh oil for every 12 hours' run and never have had a hot bearing although the engine has been in service 1½ years. In the writer's opinion an oiling system is indispensable and is a long stride towards the successful operation of an engine whether large or small. We are using the Worthington dry vacuum system with this engine and are able to maintain from 26 to 27 in. vacuum.

The next stage where heavy engine service is called into play is in the blooming mill. The blooming mill engine is the one upon which falls the heaviest work of any in a steel plant. The blooming mill engine in the plant referred to is a reversible twin engine. Both cylinders are 54 in. in diameter and 60-in. stroke. It is equipped with indirect driven piston valves. The engine has double valves, that is, two valves are provided for each cylinder both admitting steam at the same time, and both valve stems are connected to the same rocker by means of a crosshead located at the end of the valve chest.

The engine is controlled entirely by the throttle. The main throttle is operated by means of a small steam cylinder working against an oil cushion. The reversing gear is operated in the same manner thus affording a very rapid and easy way of handling the reversing gear. The links are so heavy that reversing could not well be done by the means of a reverse lever. The engine is equipped with tail stocks, and the piston heads are of the concave steel type, with one spring packing ring. The piston head is made solid and consequently there are no follower nuts to work loose. The piston rods are hollow and are 13 in. in diameter. The crankpin of the outside engine is 16 in. in diameter, while the pin in the crank of the engine next to the mill is 25 in. in diameter. This is said to be one of the largest engines of this kind in the world. It is capable of developing 8,000 h. p., at a speed of 100 revolutions a minute and steam pressure of 150 lb.

The third stage where the heavy duty engine comes into play is found in the mill in which 4 x 4 and other sizes of steel billets are made. This work is done by a tandem compound engine with cylinders 40 and 80 by 60 in. This engine is also equipped with indirect driven piston valves. The high-pressure valve is connected direct to a shaft governor, while those of the low-pressure cylinder are arranged for a fixed cutoff. The low-pressure cylinder has steam and exhaust valves of the indirect type. This engine is run condensing and is connected with a Wheeler surface condenser. Our experience with large tandem compound engines has not been of a very satisfactory nature. One reason is due to the very large steam consumption in proportion to the work done. Although the compound engine runs condensing, the steam consumed corresponds to 3,025 boiler h. p. I should not recommend tandem compound engines for heavy mill service for the reasons already given. We have large engines of the releasing gear type that are much more economical of steam.

The fourth stage in which we come in contact with the heavy duty engine is in the continuous mill. This is where we find a piece of, say, 3 x 3-in. steel entering one end of the train of rolls and being delivered of the desired size at the other end without passing back and forth as in the case of mills that are not continuous. The work in this mill is done with what is known as a heavy duty long range cutoff Corliss engine. This engine is a cross compound with cylinders 44 and 82 by 60-in. stroke. It is of the double eccentric type and is also equipped with tail stock. The piston heads are concave and of steel. The piston of this engine is fitted with one packing ring held in contact with the cylinder walls by means of springs. The ring can be gotten at quite readily by removing a light follower ring. We have found the engine to meet all the requirements peculiar to rolling mill work. Some of the more severe conditions are the sudden taking on and release of the load. Another is due to water in the steam piping caused by conveying the steam long distances. We have also found this kind of engine equal to that emergency. The steam consumption in this particular engine corresponds to 640 boiler h. p. Our repair account is very small although the engine has been in service 2½ years. The repairs do not exceed $100.

In connection with this engine we have another oiling system to which no doubt quite a large share of the success we have had is due. We never have had a hot bearing on this machine, and while the engine has been in constant use we have not taken liners out of the crankpin boxes for two years. This is due to the oiling system, for while we use a great deal more oil than is required it is not lost, but returned to the filter, cleaned and used again. Three things are accomplished by this system, namely, we lubricate the bearing, keep it clean and carry off the extra heat and this is done with oil alone. Our oil allowance for the engine is 3 gallons of fresh oil for each 24 hours. This does not include cylinder oil. The company is so well pleased with this type of engine that they are ordering more of the same kind.

The next place where we come in contact with the steam engine is in the power house where it is used in generating electric current for the lights and for operating electric transfer tables, overhead cranes, and other electrical devices used in and about a modern steel plant. The number of engines in this case is two. They are of the tandem style direct connected to direct-current generators. The service here is much

*Read at the meeting of the Ohio Society of Mechanical, Electrical and Steam Engineers. Mr. Strickland is assistant chief engineer at the Bessemer plant of the Republic Iron & Steel Co. at Youngstown, O.

the same as in all direct-current power plants so that I shall not attempt to give a detailed description of it, but shall pass on to a short description of the boilers, boiler houses and equipment.

The steam for power in the works just described is generated by eighteen water tube boilers of 350 h. p. each. They are set in batteries of two and work under 150 lb. pressure. They are mechanically fired, and are served by means of electric traveling elevators.

In preparing this paper I have touched upon none of the auxiliary apparatus, but have confined myself to the engines, my aim being to give a brief description of the kind of engines and the work expected of them in the production of Bessemer steel.

Cincinnati Machinery Market.

Nov. 29.

The Cincinnati machinery market during the past month has shown continued improvement, especially so far as the manufacturers of machine tools are concerned. The demand for lathes has been particularly good, although there is also a notable improvement in the demand for shapers. Planers found a steady inquiry, quite satisfactory to manufacturers in this line. The demand for drills has improved and correspondence gives promise of increasing activity. The sources of inquiry have been varied and the distribution general with no particular large interest conspicuous in the buying.

Boiler and engine builders report only moderate business which is attributable to the close of the building season incident to winter conditions. Inquiry in this line is also quiet, although boiler and tank concerns are busily occupied with repair work and one interest reports a large number of orders for tanks to be used as an auxiliary to automatic sprinkling devices as a protection against fire.

Trade has been largely of domestic origin, though for shipment to Japan lathe manufacturers have had a large business calling for early shipment. Some inquiries from Russia have been up also. In both these cases the tools are doubtless to be used on work for munitions of war. There is an optimistic tone all along the line and manufacturers are proceeding with more confidence in the maintenance of present conditions and in anticipation of augmenting demand.

The Bickford Drill & Tool Co. reports improved demand for drills and the outlook for the winter good.

There has been a change in the personnel of the Cincinnati Planer Co. officials. C. H. M. Atkins has succeeded W. H. Burtner as president. Mr. Burtner retires from the activities of the business owing to ill health. The company is doing a good business and reports the past month in point of orders the best for a year.

The Ansonia Copper & Sheet Iron Works will move about Dec. 15 into their new plant at Evans street and the C. H. & D. railroad. The shops of the company were burned about a month ago, and before the new shop was ready for occupancy.

The Bullock Electric Co. has made application to the council of Norwood to lay a track across Forest avenue in order to have a track connection with the foundry recently purchased from the Ballman Wilson Co.

The John Steptoe Shaper Co. notes a decided improvement in the demand for shapers the past month and regards the outlook for the winter with confidence.

The McIlvaine & Spiegel Boiler & Tank Co. has to report business largely confined to repair work and but little new business coming in except that many tanks for automatic sprinkling devices are being ordered.

Louis Rechtin & Bro. find business good in wood-working machinery and fair in the metal working line. Quite a decided improvement is noted in all classes of wood-working machinery, however, and this branch of their business is particularly active.

Greaves, Klusman & Co., say business is moving along satisfactory and correspondence indicates that the outlook is good.

The American Tool Works Co. finds a healthier tone to the general situation and regards the prospect for a busy winter as good. The company is putting on more men right along.

THE CAMPAIGN FOR SHOP SYSTEMS.

BY JOHN DRUMMOND.

The watchword of the hour in shop management is system. The magazines dealing with technical troubles and triumphs have it bad. The story is sung good and strong and articles on costs, production, piece-work and other things of vital importance are card indexed to a finish. Men are marshaled in platoons. Names give way to numbers and the new regime takes on the precision of the lock step. A lot of this is good enough for the people who like it and still better for those who can make it count for something useful. But the more I read the articles dealing with the question of system in manufacturing operations, the more vividly I realize one fact. It takes nearly if not quite as much ability to warm over another man's system for my purpose as to get up one of my own. Perhaps that is the main object of most of the articles on the subject.

To start thinking along methodical lines, to arouse discontent with inefficiency everywhere, to straighten curves and line up things generally, is all right as a program. Grafting the other fellow's ideas into my work is something of an undertaking. It's a sort of surgery that may kill the patient. The business may have to be under ether too long and the owners won't stand for invalids around the plant. The medicine may be drastic and will have to be administered carefully. Strychnine is a common remedy in the hand of a skilled doctor but not otherwise.

The system of a gun shop or a typewriter plant won't go in a jobbing shop and the methods of a lathe factory fit not closely about the builder of a long line of textile machinery. The size of the works has much to do with the case. What may be sufficient and essential for the one is altogether inadequate for the other. Just as with lubrication, the measured quantity that fits the needs is far superior to pouring on the oil from a pail.

I cheerfully confess that all businesses need system, the system that makes for orderly progress and production. But this is not the system that ties things up with red tape. The point for first consideration is not what system shall I adopt, but where is the weakest part of my manufacturing organization. Is the task of production fairly divided, and am I getting substantially accurate reports of labor and material costs? It is good to learn records of operations on every part of any standard machine and there is really no reason why these should not appear on blue prints as reminders to workmen and as incentives to still better things. The knowledge by the workman that his records are regularly inspected and compared will tend to keep him in touch with the blue printed statement and in turn make for efficiency.

There is a tendency to take away the individuality of the workman. Of course he nowadays frequently uses gauges with little concern for dimensions. His knowledge of fits and finish must, however, be as keen as of old and I have as much regard for him as ever. For this reason I do not take kindly to the military idea which is settling in certain quarters and affects employers and workmen alike. The rush to organization assuredly helps the weak but I see little in it for those who can stand alone. The individual workman of skill and character does not need the assistance of numbers to a claim for consideration and I am sure that shop conditions should cultivate the self-respect of mechanics. In short, I approve of individuality in shops and its encouragement by all practicable means.

I am well aware that some successful managers of men are in favor of numerous foremen. A ratio of one to five is not rare but each workman can rest assured that in some way he contributes to the extra pay enjoyed by the foreman. Exactly as he realizes this fact will be strive for a change. Here is where the record on the blue print will help. It should leave no room for doubt as to whether it is estimated or actual

time. The record has another value. It brings the draftsmen in touch with the cost of labor and therefore makes for simplicity in machine work and greater accuracy in future estimates.

System is not a new pursuit. In the old time shop system planted the grindstone in the center of the floor and paths of least resistance led to it from every side. The office could be anywhere, lighted and equipped with rough and ready simplicity. The stock room and the tools were spread thin about the floor and benches, hung on the posts and gave variety to the walls. So long as stock and tools were not in the way of comers to the grindstone and the outer door was easily attained when homeward bound, system prevailed. The slow grindstone is seldom a political center of activity now but there is as much need as ever of sharp tools and keen workmen. Such system as makes for these and no more is the method most worthy of study.

NEW BOOKS.

The Architects' and Builders' Pocket Book, by Frank E. Kidder, has attained a 14th edition and in the 20 years has grown from 586 to 1,655 4 x 6¾-in. pages. The number of pages indicates the comprehensive character of the book which is a worthy companion to the handy volumes by Messrs. Trautwine and Kent. The increased size renders the old term, pocket book, less of a fit than ever but as its principal usefulness will be at the desk and drafting table the book is most conveniently arranged for ready reference. When the book was first prepared for print early in the eighties, structural engineering was mainly concerned with bridge work and in the interim the progress of industry has wrought great changes. The growing utility of steel and reinforced concrete has brought about a condition of affairs where the structural engineer is now more in touch with the architect than with the civil engineer. The space given to the use of steel in building construction is therefore proportional to the importance it has latterly assumed and the author has made liberal use of the data provided by the manufacturers of structural material. Not the least serviceable part of the book is the list of manufacturing firms, most of whom publish catalogues containing information of a valuable character. Some of the firms named receive special mention for the reference pamphlets published. Such a list could easily be extended and be of quite general benefit. A summary of the many subjects covered tersely by the author would be beyond the limits of the present review. The field he has tilled is large truly but the task of meeting all reasonable requirements has been done conscientiously and—so far as the present examination has disclosed—the treatise exhibits conspicuous ability. The book has been admirably printed and bound. The reproduction of tabular matter, and engraving is here and there capable of slight improvement, nevertheless. The table of combustibles, on page 1,108, is an instance in point. Here several columns are inverted to the rest of the text and the book must be turned upside down on referring from one to the other. These are, however, purely mechanical details easily remedied. The book is published by John Wiley & Sons, 43-45 East Nineteenth street, New York, and is substantially bound in leather. Price $5.

Smoke Prevention and Fuel Economy, by Wm. H. Booth and John B. C. Kershaw, is based on the work of E. Schmatolla but is much more than a mere translation of the German treatise. Mr. Booth was formerly of the Manchester Steam Users' Association, is a well known writer upon technical subjects, and his associate is a practical chemist. The co-operation of the authors has been very successful and the principles of fuel combustion and the means by which the practice is conducted are briefly but adequately discussed. The physical and chemical conditions involved are given due consideration and there are descriptions of American and English appliances, mechanical stokers, etc. The introduction presents some historical notes and closes with an approving reference to the suggestion of B. H. Thwaites for the solution of the domestic smoke problem. Mr. Thwaites proposes to carbonize coal in retorts to the extreme point, exhaustion of the retort carried to depletion of all the volatile gases. The coke is converted in separate producers and the resulting gas mixed with the retorted product. The same gas mains would then supply gas for heat, light or power. The following chapters treat of the chemistry of the combustion process, present methods of burning fuels and their defects, improved methods of burning fuel, examination of waste gases and control of the combustion process, patent abstracts, etc. There are a number of useful tables and many informing illustrations. The book contains 194 5½ x 8½-in. pages, has a good index and is bound in cloth. Price $2.50. The Norman W. Henley Publishing Co., 132 Nassau street, New York.

Fowler's Electrical Engineer's Year Book for 1905 is at hand and shows a substantial increase over the one for the present year. It has additions to the sections dealing with measuring instruments, the management of dynamos, electrical distribution, secondary batteries, lighting, traction, etc. A few pages of advertising encroach upon the text but not to any very objectionable extent. There are some 590 4 x 6-in. pages neatly bound in leatherette. Price 1s. 9d. The Scientific Publishing Co., 53 New Bailey street, Manchester, Eng.

The proceedings of the twelfth annual convention of the National Railroad Master Blacksmiths' Association gives a verbatim report of the sessions held at Indianapolis on Aug. 16-18 of the current year. A number of the papers presented were printed by the technical press but will easily bear a second reading. These and others are eminently worthy of filing for future reference and the book has been admirably edited and indexed for this purpose. It is 6 x 9-in. with 230 pages bound in cloth. The secretary of the association, A. L. Woodworth, of Lima, O., is to be congratulated on a prompt and excellent publication.

The latest issue of the Bulletin of the Bureau of Labor at Washington, D. C., is a portly book of 1,490 6 x 9-in. pages treating of the exhibit of the Bureau at the St. Louis Exposition. The charts and photographs are reproduced with the information upon which they were based and there is some account of the research work undertaken in connection with the preparation of the exhibit. The graphic charts are an especially attractive portion of the volume. These are done in colors and present as no other means can the important characteristics of the tabular matter. Especially are the charts informing with regard to comparisons between labor conditions by states, trades, etc., and for the showing they make in reference to strikes. The photographs tell of the housing of working people and what is being accomplished by the Colorado Fuel & Iron Co. in the West, the J. B. & J. M. Cornell Co. at Coldspring, N. Y., the Draper Co. at Hopedale, Mass., the N. O. Nelson Mfg. Co., at Leclaire, Ill., the Maryland Steel Co., at Sparrows Point, Md., the Westinghouse Air Brake Co., at Wilmerding, Pa., and others. Trade schools come in for general description and illustration and there are many other features of interest to those in sympathy with betterment operations. The work has been under the general supervision of G. W. W. Hanger, acting commissioner, and he has personally prepared much of the matter.

The firm of J. E. Schlieper & Co., Allegheny, Pa., has been organized by J. E. Schlieper and P. A. Fenian to do general contracting and engineering work. The firm will pay special attention to the designing and building of furnaces for rolling mills, and steel works.

The East St. Louis plant of the American Steel Foundries, has resumed operations. The business of this company has recently increased rapidly.

PRODUCTION OF NATURAL GAS.

The division of mining and mineral resources of the United States geological survey has issued a pamphlet by F. H. Oliphant on the production of natural gas in 1903, which was greater than in any previous year and was valued at $35,815,360, an increase of 16 percent over 1902. Of the total value of all the natural gas produced in the United States during 1903 Pennsylvania furnished 45.18 percent, West Virginia 19.2 percent, Indiana 17 percent, Ohio 12.5 percent, Kansas 3.14 percent, New York 1.35 percent, leaving a little less than 2 percent for all of the remaining States and Territories. Only in the State of Kansas did the value of the natural gas exceed that of the patroleum. Louisiana is the only State producing petroleum in any quantity that did not produce any natural gas to be sold, or even to be consumed by the producer. The general average of the price received for the sale of natural gas in 1903 was very slightly greater than in 1902, being about 15 cents per 1,000 cubic feet at an average pressure of about 4 ounces per square inch.

Concerning the early introduction and subsequently improved methods of consumption, the report says:

"The introduction of natural gas into commercial use was slow, and it required several years for its value to begin to be appreciated. After its value was fully demonstrated, there was a rush of capital, and a large amount of money was invested in gas territory, gas wells, and pipe lines. Thus suddenly introduced, it was sold to consumers at prices that were ruinously low without regard to the manner of its consumption, manufacturers being charged on the amount of finished products and individuals being allowed to consume it in coal stoves and open fireplaces. It was not until after several years of the most reckless competition and the most extravagant methods of consumption, and not until the then known reservoirs showed signs of failing, that it began to be realized that their exhaustion was rapidly approaching and that a large proportion of the gas originally in these natural reservoirs had already been removed. This realization brought about retrenchment and reform in the methods of transportation and of consumption, introduced at first by the larger companies and soon followed by those of less importance. This caused a readjustment and consolidation of a number of companies that had hitherto been competing for the sale of natural gas. For a number of years, after the partial exhaustion of the near-by fields, only the household trade could be supplied by them, and in many cases that was but indifferently supplied in the cold season of the year. A number of manufacturers have from the beginning owned their plants, and have had a supply that was generally quite regular, as it was not subject to the fluctuations of the domestic service. One of the most successful appliances for economical use in the whole history of the industry is the gas meter, and its introduction has resulted in greatly increased revenues to the natural gas companies without seriously increasing the cost to the consumer, who is also interested in seeing that the gas is consumed in an economical manner. Stimulated by the success of more business-like methods and increased revenues, the natural gas companies have invested many millions in enlarging their capacity, extending their mains, and acquiring additional gas territory.

"Another economical reform, gradually carried out, was in the better distribution of the regulators which feed from the higher to lower distributing mains, together with the enlargement of many of the mains in crowded districts in cities and towns, which caused a lower and more even pressure throughout the plant. Originally the gas pressure in the wells was sufficient to transport large quantities in ordinary sized pipes to points of consumption many miles distant. In many instances during recent years the gradual falling off of the natural pressure has made it necessary to install powerful pumping or compressing machinery, which was described in detail in this report for 1900. These pumping plants are usually very fine specimens of mechanical engineering, and their economical achievements are equal to the best results attained elsewhere. By far the most economical results have been secured by large gas engine compressors, in which natural gas is exploded instead of steam being used, and in which 9 cubic feet have developed 1 h. p. per hour, while working at about 1,000 h. p. capacity. Thirty cubic feet of gas have been compressed from 0 to 270 pounds pressure to the square inch by the consumption of 1 cubic foot of natural gas, whereas double that amount of gas is consumed under boilers supplying double expansion condensing steam engines to do the same work.

"In recent years there has developed a general extension of many of the large lines supplying central western Pennsylvania and northeastern Ohio into the deep and prolific fields of southwestern Pennsylvania and western West Virginia, which are now operated in a most economical way, enforced by the dearly learned lessons of the reckless exhaustion of the original fields of Pennsylvania, Ohio, and Indiana. Much larger lines have been recently constructed, and the increase in diameter has added largely to their capacity and has increased the quantity of gas delivered at points of consumption. It is unfortunate that there is still a large quantity of natural gas wasted in southwestern Pennsylvania and West Virginia, where many of the upper gas producing strata are pierced when drilling for petroleum stored in the underlying sands."

Commenting on the application and economy of the natural gas engine, Mr. Oliphant says:

"The natural gas engine has been extensively introduced throughout the gas belt. Its application was first made about ten years ago, when it was used in pumping petroleum wells. Afterwards, ranging from 5 to 1,000 h. p., it was extensively introduced into manufacturing, pumping, and compressing plants, and it has successfuly demonstrated its economy and reliability. It is particularly applicable to the pumping of oil wells and to driving pipe line pumps, owing to the large number of points that are often widely separated and are difficult to supply with other fuel. The gas engine has in very many instances replaced the steam engine and boiler. In some instances this has been done by removing the steam engine entirely; in others by the substitution of a gas cylinder for a steam cylinder, on the same engine bed. The dispensing with the troublesome boiler and the substitution of a much more economical engine has placed in the hands of the oil operator a much cheaper source of power, not subject to the contingencies of the former method, with a great saving of labor and material, and also a great saving in the quantity of gas consumed."

The McKees Rocks plant of the Pressed Steel Car Co., Pittsburg resumed operations in full this week, increasing its output to about 50 cars daily. Orders have been issued to resume operations at the Allegheny plant which has been closed for nearly a year. The company is reported to have orders on its books for nearly 10,000 cars and with the Allegheny plant in operation the daily output will be increased to about 70 cars.

Rapid progress is being made in the construction of the gun plant of the Driggs-Seabury Ordnance Corporation at Sharon, Pa. The main building is already under roof and much machinery has already been installed. It is probable that operations will begin shortly after the first of the year. The main building is 440 feet long and 100 feet wide. Rapid fire guns and projectiles will be manufactured.

The plant of the Zanesville Iron Co., Zanesville, O., was sold at master commissioner's sale Nov. 26 to A. Shonberg, a scrap iron dealer of Newark, O., for $24,005.

EARLY SUGGESTIONS OF DRY AIR BLAST.

To the Editor: I have read with great interest the paper by Mr. James Gayley, on the application of dry air blast to the manufacture of iron, which was so ably presented at the New York meeting of the Iron and Steel Institute last month. In glancing through the book "On the Manufacture of Iron" by Frederick Overman, M. E., published in Philadelphia in 1854, which I have in my library, I find the following, which is rather interesting as the opinion of an expert of half a century ago:

"The air introduced by the blast machine into the furnace should be as dry as possible. The main reason that blast furnaces do not work so well during the summer and clear warm weather, as during winter, and cold, rainy days in summer, is that a large amount of watery vapors is mixed with the atmospheric air in hot weather. This water is very injurious in a furnace, as we shall hereafter see. To keep the air dry, the blast machine should be erected at the coldest and driest spot we can possibly select. We should take especial care that it is not exposed to the hot air around the furnace, and that it is beyond the reach of the steam engine, for the air will be more moist around the engine and the heated furnace than anywhere else. The best means of making a furnace work well during the summer would be to put the blast machine in an ice cellar."

A glance at the last sentence above shows us that the idea which is now so ably developed by a master mind was indeed a creation of a noted metallurgist of the old school.

RICHARD PETERS, Jr.

Chester, Pa.

Canadian Ore Production.

The second volume of the Census of Canada for 1901 dealing with natural products has just been issued. It gives the total output of iron ore at 301,143 tons as compared with 223,057 in 1881, and the quantity marketed was 283,124 and the quantity treated at the works 18,019 tons. The employes of all classes numbered 1,191, receiving wages and salaries amounting to $271,691. The statistics of iron and steel manufacturing have not yet been published.

The Flagler Iron & Steel Co., which recently purchased the Kloman mine at Republic, Mich., immediately set to work preparing for the opening of the property. A temporary boiler and pump station near the shaft has been placed in operation and is taking out the water. It is thought that the temporary plant is sufficiently large to free the works of water, but the outfit will be discarded as soon as the new machinery is installed. Preparations are being made for the erection of a new engine house, 80 x 50 ft., and a blacksmith shop, 30 x 16 ft. It has not been decided whether the present shaft will be used for mining or whether a new one will be sunk. If the old shaft is retained, it will be enlarged and will be equipped for rapid and economical hoisting. Captain John Cowling is in charge of operations.

The Florence mine on the Gogebic range has been shipping ore rapidly and it is estimated that the season's shipments will aggregate 140,000 tons, which will be a larger amount of ore than has been shipped by the Florence in any year since 1890. When the seasons of navigation closes a considerable amount will be shipped by rail to Milwaukee furnaces. The company is enlarging and extending its stock pile room by removing immense piles of rock and sand that have long interfered with ore dumping.

The ingot equipment of the old Henderson steel plant at North Birmingham, has been purchased by the Birmingham Steel & Iron Co., Birmingham, Ala., which is now making steel ingots for the Southern trade.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of Their Wants:—

The Cain-O'Berry Boiler Co., Orlando, Fla., recently incorporated, succeeds Cain & O'Berry, designers and builders of steam boilers. The company is in the market for machines for cutting and threading heavy pipe and for a bolt cutter. The stockholders are: L. C. Massey, John M. Cheney, J. M. Pedrick, J. H. O'Berry and J. W. Cain. The officers are: President, J. W. Cain; secretary and treasurer, J. H. O'Berry. The plant is about ready for operation and will begin manufacturing in a few days. The power will be furnished by electric motors.

The Rifled Pipe Co., San Francisco, Cal., has been incorporated with a capital of $200,000, to manufacture an invention of John D. Isaacs of Oakland, Cal. The patent covers the manufacture of a rifled pipe, to be used as an oil conduit. Centrifugal action of water is to be used in accelerating the movement of sluggish fluids. Plans are not fully developed and the company is not prepared to say when it will erect a plant.

The F. Kuchenbeiser Co., San Jose, Cal., has been incorporated with a capital of $10,000, to carry on a general foundry and machine business. The directors are: F. Kuchenbeiser August N. Kellner, Emma H. Woodrow, T. C. Barnett and V. A. Scheller.

The Stolp Mfg. Co., Chicago, Ill., has been incorporated with a capital of $10,000, to manufacture machinery. Incorporators are: Frank H. Stolp, Walter F. Schneider and Edwin H. Abbott.

The Brown-Sphinx Co., Chicago, has been incorporated with a capital of $25,000, to manufacture railroad supplies. Incorporators are: J. R. Kehlor, R. L. Brown and James Finnegan.

The William Lloyd Machinery Co., Chicago, has been incorporated with a capital of $2,500, to manufacture machinery and supplies. Incorporators are: James B. Kelly, Charles H. Soelke and Henry L. Bullen.

The J. V. Newlin Mfg.. Co., Sebring, O., has been incorporated with a capital of $10,000. Incorporators are A. L. Baker, J. V. Newlin, W. A. Byrnes, Fred Sebring and Frank A. Sebring.

The Upson Rotary Motor Co., Jacksonville., Fla., has been incorporated with a capital of $150,000, to manufacture the Upson rotary motor. Officers are: Delevan P. Upson, president; Freeman S. Hodges, vice president and Walter Mucklow, secretary-treasurer.

The Magnetic Control Co., New York City, has been incorporated with a capital of $1,000,000, to manufacture electrical magnetic appliances. The directors are: A. Leonard Braughan, George W. Giddings and Albert Graham, of Brooklyn, and others.

The Kemp Mfg. Co., Kankakee, Ill., has been incorporated with a capital of $55,000. Incorporators are: James Kemp, M. B. Haslett and J. H. Merrill.

The Diamond Foundry Co., Binghamton, N. Y., has been incorporated with a capital of $6,000. Incorporators are: F. Eitapene, E. I. Sherman, James Green, all of Binghamton.

The Cleveland Tool Co., of Corsicana, Tex., has been incorporated with a capital of $25,000, to manufacture mining tools, etc. Incorporators are; J. W. Sloan, A. D. Hamilton and H. Brasher.

The Drury-Kneisly Mfg. Co., Dayton, O., capital $20,000, has been incorporated to manufacture machinery; by Peirce D. Schenck, Charles E. Drury, Torrence Huffman, Daniel W. Kneisly, Daniel W. Altman.

Fires and Accidents:—

Fire in the pattern shop of the foundry of Bell & Fyfe, Brooklyn, N. Y., resulted in the destruction of a two-story

building and valuable patterns and molds. Loss is estimated at $7,000.

The steel hollow-ware plant of the Cheswick Mfg. Co., Cheswick, Pa., was damaged by fire Nov. 19. Loss, $20,000.

Fire in the first floor and basement of the building at 318 Market street, Philadelphia, occupied by Jackson & Cook, wire work manufacturers, caused damage amounting to $10,000.

The Pott & Bastine foundry, Pottsville, Pa., was destroyed by fire Nov. 21. Loss was $6,000.

The Texas Midland machine plant and carpenter shops were burned Nov. 21. Loss is estimated at about $50,000.

Fire in the plant of the Corona Coal & Iron Co., Corona, Ala., Nov. 24, resulted in a loss of $30,000.

All of the shops of the Frisco railroad at Memphis, Tenn., with the exception of the round-house and machine shop, were destroyed by fire Nov. 23. Loss is estimated at $50,000.

New Construction:—

The Wohrle Stove Foundry Co., Newark, O., has just started work on another large building. The company already has 15 acres under roof.

The Tennessee Stove Works, Chattanooga, expects to have its plant in operation by February 1. There will be two brick buildings, one of which will be 100 ft. long and the other 200 ft. in length. Machinery will soon be ordered.

Extensive improvements are soon to be made at the Exeter Machine Works, West Pittston, Pa. The company has purchased a plot of ground opposite its present plant, and will erect a complete new steam plant and electric light plant. A large number of orders are on hand.

The contract for the new shop to be erected by the James Leffel Co., Springfield, O., has been awarded to the Garry Iron & Steel Co., of Cleveland. The building will be 56 x 216 ft. one-story, and will be constructed of steel.

The Pennsylvania Railroad is receiving bids for the construction of its proposed new power house, repair shop and other buildings at the new terminal in Washington, D. C. The power house proper will be 77 x 238 ft. and 64 ft. high, while the repair shop will be 30 x 156 ft. and 36 ft. high.

The United Engineering & Foundry Co. Pittsburg, will build an extension to its Lloyd Booth plant in Youngstown, and has awarded the contract to Heller Bros. & Co. The machine shop will be extended 30 ft. and new machinery will be installed.

The American Graphophone Co., Bridgeport, Conn., has awarded the contract for the erection of an additional foundry, which will be a brick and steel structure, 63 x 148 ft. This is the last of the series of buildings which the company planned some time ago, and when completed will make a spacious plant.

The American Wire Cloth Co., Clinton, Ia., will be installed in its new quarters before the holidays. The brick work of the new plant has been completed. The wire cloth building is a handsome structure, with a frontage of 154 ft. and a depth of 227 ft.

The Emerson Mfg. Co., Rockford, Ill., has begun work on an additional story to its machine shop, which will be 50 x 244 ft.

The foundation for the addition to the Stephens-Adamson machine shop, Aurora, Ill., is finished and work on the building will be commenced at once. The cost will be about $10,000.

The threading department of the Reading Iron Co.'s plant, Reading, Pa., is practically finished. It is one of the most complete of its kind in the country. Nearly all of the plant of this company has been rebuilt within a few years and the capacity has been almost doubled. The company is now erecting a four-story brick building in which to store its patterns. It is expected within the next year or two a foundry and erecting shop will be built in connection with the Scott Works.

Babcock & Wilcox are adding to their large boilermaking plant at Jersey City, N. J., a pattern and carpenter shop.

Paxton & Vierling, Omaha, Neb., are grading a lot 100 x 120 ft., adjoining their property, and at a meeting of the directors to be held in January it will be decided whether a new building will be erected.

The Cincinnati Engine & Pump Works, Cincinnati, will build a three-story brick machine shop at Cook and Alfred streets. The estimated cost is $20,000.

At a public meeting held a few evenings since, the business men of Janesville, Wis., considered a proposition from C. M. Holbrook and others of Chicago to locate an iron manufacturing plant in that city.

Schaum & Uhlinger, Second street and Glenwood avenue, Philadelphia, will build a foundry addition 118 x 50 ft.

The Chicago Steel Mfg. Co. has not yet made definite arrangements for rebuilding its plant recently burned at New Castle, Ind. The company hopes, however, to be able to start up again in a very short time.

The M. F. Lieberman Sheet Metal & Roofing Co., Economy, Pa., whose sheet metal works were recently destroyed by fire, has erected a temporary frame building where it is carrying on its business and expects to build early in the spring a brick structure 50 x 75 ft.

The Jacobs Steel Excavator Co., Amboy, Ill., recently incorporated, does not expect to build before spring. Its excavators are being used by A. M. Sham Construction Co., Dixon, Ill.; E. L. Titus, Steward, Ill.; F. M. Johnson, Steward, Ill., and by other purchasers and are giving excellent satisfaction.

The Watson-Stillman Co., New York, one of whose buildings at Aldene, N. J., was recently damaged by fire, is rebuilding and the main machine shop is again under cover. The building was one of six, none of the others being damaged at all.

The New Castle Stamping Co., New Castle, Pa., has added to its plant a new mill 40 x 100 ft.; annealing room, 30 x 100 ft.; five muffle furnaces, a double smelter and a large annealing furnace. The company has also increased the space in the enamel shop 60 x 80 ft. The additions and improvements have enabled the company to double its output.

The Knox Motor Truck Co. will erect a plant at Brightwood, Mass., to manufacture motor trucks. Until the plant is completed the trucks will be manufactured by the Bausch Machine Tool Co., Brightwood. The company's capital is $100,000, and it has recently been organized.

The Reinecke Coal Mining Co., Madisonville, Ky., will erect a building 40 x 80 ft. to replace machine shop burned recently.

A company composed of F. A. Backstrom, J. A. Babcock and Paul Bauknecht will soon be formed for the purpose of operating a foundry at Muskegon, Mich. A site for the plant has been purchased.

The Norfolk & Western railway has awarded a contract for erecting a machine shop 59 x 199 ft. at Roanoke, Va. The cost will be $16,500.

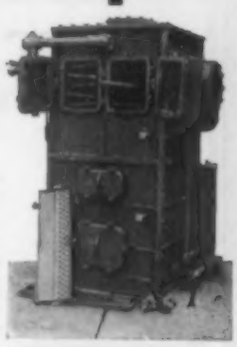
The Cleveland Hardware Co., Cleveland, has awarded the contract to John S. Gill & Sons, Cleveland, for erecting a warehouse at a cost of $100,000. The structure will be four stories, of fireproof construction, and work on the building will be begun in March.

The W. S. Tyler Co. has let the contract for the erection of a four-story addition to its plant on Aaron street, Cleveland, to John S. Gill & Sons of that city. The addition will cost about $40,000.

The William B. Pollock Co., Youngstown, O., is considering the erection of a large addition to its plant. The addition will be 192 ft. long, 120 ft. wide and 68 ft. high.

Corrigan, McKinney & Co., Cleveland, blew out their furnace at Charlotte, N. Y., Nov. 29, in order to make improvements to the hoisting equipment. When the furnace was purchased about two years ago, it was producing less than 100 tons of iron, but improvements were made and it has been gradually worked up to making from 200 to 225 tons daily. The improvement of the hoisting apparatus has become a necessity.

FEED WATER PURIFICATION



Our System of feed water purification provides for saving and utilizing all condensed exhaust that is worth saving, and for treating the raw water required for supplementing this condensation by chemical means and with simple mechanical aids, thereby preventing the formation of hard scale in the boilers and at the same time utilizing any free acids present in the water which might cause corrosion. The System also utilizes exhaust steam to the fullest extent for heating the feed supply.

It is a commercially practicable method for securing the desired results with the minimum expenditure for the cost of the apparatus, for the chemicals used, and for the attention required. It is practicable, comprehensive and thorough. Your engineer or fireman can operate it without interfering with his other duties.

That it is good and well worth your while to investigate is evidenced by the fact that we have completed installations of these Systems aggregating over 500,000 H. P.

Greater savings can be effected by keeping scale out of boilers than are possible through any changes that can be made in engines or boilers. Besides the cost of removing scale there are boiler repairs and new boilers, shutdowns, tremendous extra coal consumption and loss of steaming power. Beyond question we can help you and the cost will be most reasonable. One plant that we have equipped aggregates 63,000 H. P.

Let us know when you are ready to go into the subject of purifying and heating your feed supply.

HARRISON SAFETY BOILER WORKS, Clearfield and 17th Sts., Philadelphia, Pa.

Manufacturers of Cochrane Feed Water Heaters, Cochrane Steam and Oil Separators and the Sorge-Cochrane Systems.

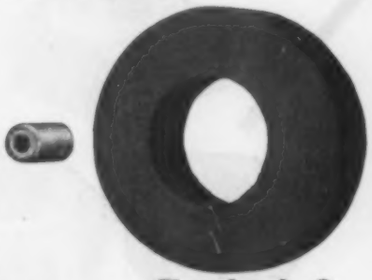
PUNCHES AND DIES

Any Standard—Any Size.
Guaranteed Quality.

We mention quality because our prices would lead you to think we were offering an inferior article.

A trial order will convince you that in this case "the cheapest is the best."

Send in your specifications today.



THE CLEVELAND PUNCH & SHEAR WORKS CO., - - - Cleveland, O.

Manufacturers: "CLEVELAND" PUNCHES, SHEARS, ROLLS, PLATE PLANERS, ETC.
"Our Name Denotes Quality."

THE WHITMAN & BARNES MFG. CO.

KNIFE HANDLE WRENCH

CHICAGO
SAN FRANCISCO
KANSAS CITY

CINCINNATI
AKRON
MINNEAPOLIS
PARIS, FRANCE

NEW YORK
ST. CATHARINES, ONT.
LONDON, ENG.

COLD ROLLED

For Blanking Stamping and Drawing. In Coils or Cut to Lengths.

STRIP STEEL

All Widths Gauges and Tempers. Prompt Deliveries.

COLUMBIA STEEL WORKS—ELYRIA, OHIO

FOUNDRY SUPPLIES

GENUINE EAST INDIA PLUMBAGO

DIRECT *from the* LAND *of the* HOTTENTOT

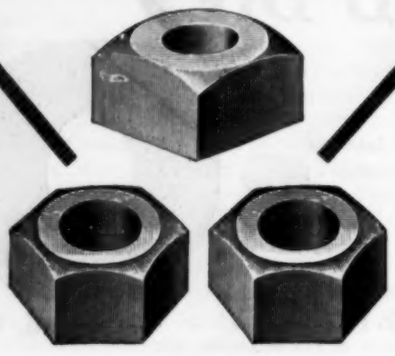
IN ORIGINAL PACKAGES

NO ADULTERATION

Frederic B. Stevens

Cor. Larned and Third Sts. **Detroit, Mich.**

"MILTON"



NUTS

HOT PRESSED *or* COLD PUNCHED

Are made of double refined bar iron. They're true to size, and well finished. This ought to interest you, but if not—the price certainly will.

CATALOG?

THE MILTON MANUFACTURING CO., Milton, Pa.

WIRE MILLS

Producing wire
for nails, market, and fine wire
Tinning wire and Galvanized wire outfits

CHAIN FACTORIES

Improved
ring and link
Winders, Cutters, Hammers,

Clay Working Tools

New Plants installed.
Old Plants made new.
While you are getting, get the best.

1856 Nearly 50 years' experience behind our goods 1904

Write for prices, stating capacity wanted

THE TURNER, VAUGHN & TAYLOR COMPANY

Cuyahoga Falls, O., U. S. A.

Superior Charcoal Iron Company,

Grand Rapids, Michigan,

Manufacturers of Car Wheel, Malleable, Special Cylinder and Strong Foundry Irons.

The well-known brands of Lake Superior Charcoal Pig Iron—

PIONEER, CHAMPION, ELK RAPIDS, ANTRIM, EXCELSIOR, PENINSULAR, MARQUETTE, MICHIGAN and CRESCENT.

THE BUCKEYE ENGINE

HAS NO EQUAL FOR

Economy, Regulation, Durability

IN HORSE-POWERS FROM 20 TO 8,000

Largest Line of Modern Engine Patterns in the United States

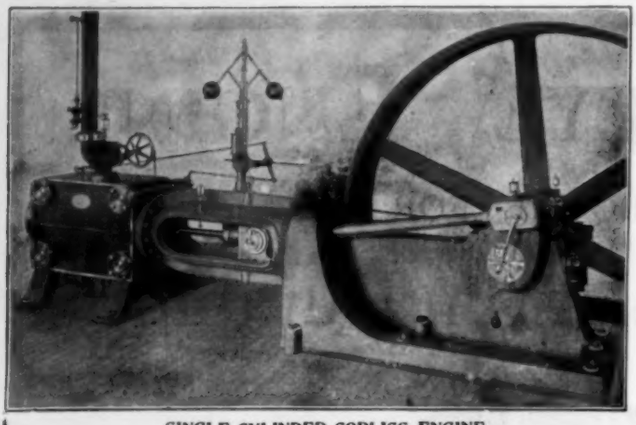
Horizontal, Vertical, Horizontal-Vertical
Simple, Tandem, and Cross Compounds
Condensing and Non-Condensing
Low, Medium, and High Speeds

ADAPTED TO ALL CLASSES OF WORK

Buckeye Engine Co.

Salem, O.

Watch this ad.



SINGLE CYLINDER CORLISS ENGINE

Established 1867.

THE VILTER MFG. CO.

1006 Clinton Street,
MILWAUKEE, WIS.

Builders of Improved

Corliss Engines

High Pressure, Compound
and Compound Condensing.
Girder or Heavy Duty Bed.

ICE MACHINES.

Allis-Chalmers Steeple Compound
Blowing Engine

Allis-Chalmers Co

MILWAUKEE, WIS., U. S. A.

Corliss Engines

for all Power Purposes

We build them in all approved types.

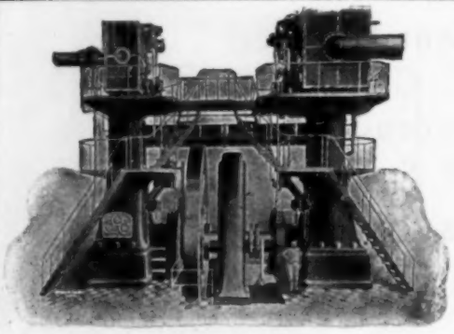
Smaller Sizes from 25 h. p. up

Pumping Engines, Hydraulic Turbines,
Perforated Metals for all purposes

Bullock

Electrical Apparatus
for all purposes

Canadian Representatives: Allis-Chalmers-Bullock, Ltd., Montreal.



1127 Marquette Bldg., Chicago.
39 and 41 Cortlandt St., New York.
1316 Chemical Bldg., St. Louis, Mo.
403 Equitable Bldg., Atlanta, Ga.
716 Empire Bldg., Pittsburg.
C. C. Moore & Co., San Francisco, Cal., Charlotte, N. C.

Hamilton Corliss Engines

and

Hamilton Holzwarth Steam Turbines

ENGINES and STEAM TURBINES
for all purposes.

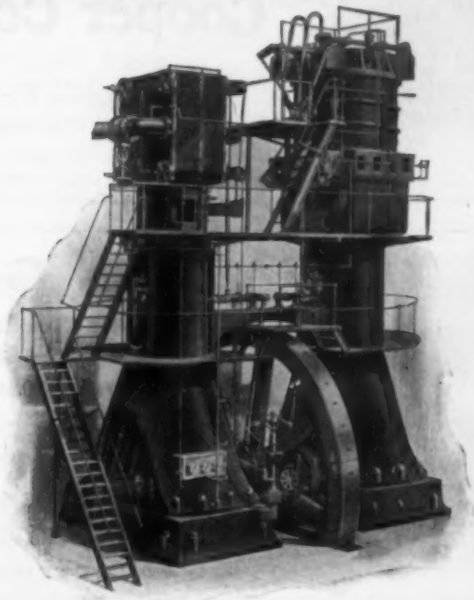
Send for Catalog V of Vertical Engines.

The Hooven, Owens, Rentschler Co.

HAMILTON, OHIO

THE WILLIAM TOD COMPANY

ENGINE BUILDERS



Main Office and Works: YOUNGSTOWN, OHIO

Agencies { **GEORGE F. WOOLSTON - - 29 Broadway, New York City**
THE RUST ENGINEERING CO. - - - Birmingham, Ala.

Save Fuel and Boilers

By putting your water in the boiler at boiling point with

THE OTIS

TUBULAR FEED WATER HEATER, OIL SEPARATOR AND PURIFIER.

OUR STANDARD HEATERS ARE GUARANTEED to heat the water to the boiling point (210°) or (212°) with the exhaust steam without causing any back pressure. Also to *extract the oil* from the exhaust, so that the exhaust steam, after being passed through the heater, can be used for other heating purposes and the water of condensation from the heating system be returned to the boilers *without the extra expense of an additional oil separator or eliminator.* We *guarantee this heater will not get foul with sediment*, but will continue to heat as hot after being in use years, as when new.

A LIBERAL OFFER.

Try us. If this heater fails to give satisfaction in every respect, we will pay freight both ways and all expenses.

Power pumps for all purposes and any capacity.

Patented and Manufactured by the

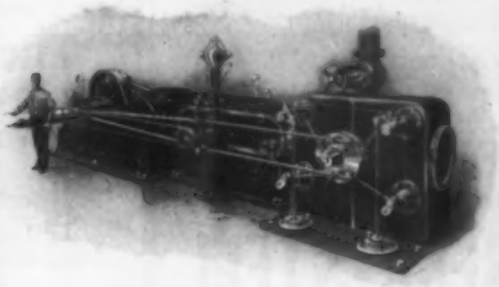
Stewart Heater Co.

182 Norfolk Ave.,

BUFFALO, N. Y.

SEND FOR CATALOGUE.

ATLAS



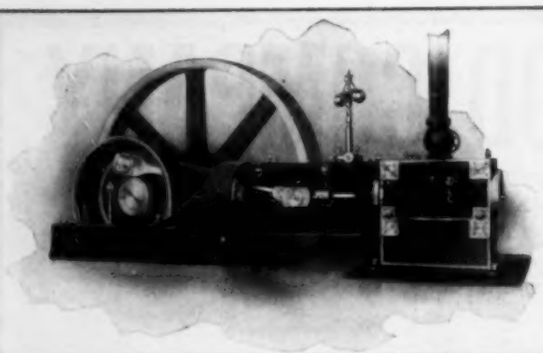
ENGINES and BOILERS

Corliss	*Water-Tube*
Four-Valve	*High Pressure Tubular*
Single-Valve	*Standard Pressure Tubular*
Automatic	*Internal Fired*
Throttling	*Locomotive Type*

FOR IMMEDIATE DELIVERY

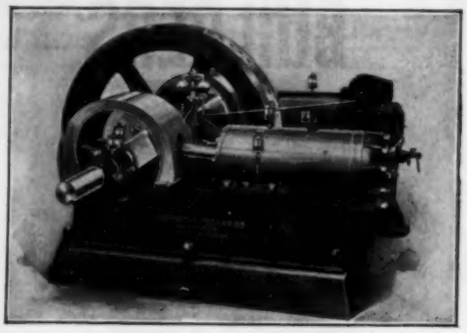
One—18 x 34 x 42 R. H. Heavy Duty Corliss.
One—15 x 28 x 42 R. H. Heavy Duty Corliss.
These are new engines, never out of the shop.

Atlas Engine Works.
Indianapolis.



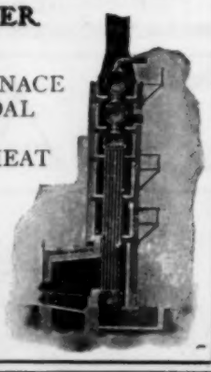
THE C. & G. COOPER COMPANY
MT. VERNON, OHIO
BUILDERS OF
Cooper Corliss Engines
BOTH HORIZONTAL AND VERTICAL
Special Engines for heavy Rolling Mill service
Write for estimates

New York No. 1023 Havemeyer Bldg. | Boston No. 411 Weld Bldg. | Chicago No. 1460 Monadnock Block | Atlanta No. 315 Empire Bldg.



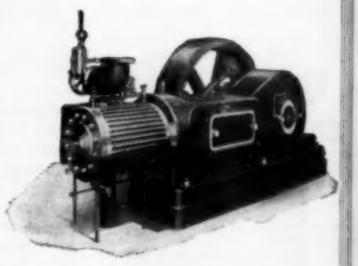
WARREN GAS ENGINES
SINGLE, DOUBLE and MULTI-CYLINDER TYPES,
ADAPTED FOR ALL POWER PURPOSES.
30 H. P. to 1000 H. P.
Special Attention given to the Erection of
Large Units for use with Producer Gas.
STRUTHERS - WELLS COMPANY
Warren, Pa.
NEW YORK OFFICE: 26 Cortlandt Street

WHEELER vertical water tube BOILER
for
BLAST FURNACE GAS, COAL and WASTE HEAT
Send for Catalogue
W. W. SHILLING
General Sales Agent
Sharon, Pa.

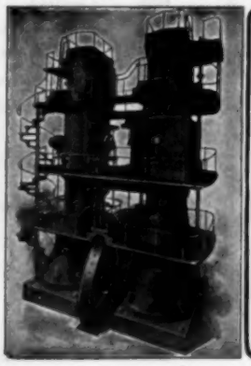


The "Original Gandy" Stitched Cotton Duck BELTING
Specially adapted to places where belts are exposed to water, heat, steam, oils, atmospheric changes, etc. Costs about one-half as much as the best leather belt on the market—has greater lasting qualities and will outwear any other make of belt. It is used with the greatest satisfaction as a main driver, conveyor or carrier. Give the Gandy Belt a trial and be convinced of its high merit. Beware of imitations. The real article stamped every ten feet. "Original Gandy Belt." Sole manufacturers.
For Strength, Traction, Power and Durability it is without an equal.
THE GANDY BELTING CO. Baltimore, Md.

The Ball Engine Co.
ERIE, PENNA., U. S. A.
With 23 years' successful experience.
Over 500,000 Horse Power in actual use.
This record a guarantee of the quality of our work.
Horizontal and Vertical
CORLISS AUTOMATIC



SEMI-STEEL ONLY
IN OUR NEW PLANT
1201-1217 Fillmore St.
CHICAGO
—
The Francis & Nygren Foundry Co.



SOUTHWARK FOUNDRY AND MACHINE COMPANY
— FOUNDED 1836 —
PHILADELPHIA, PA.
SOLE MAKERS OF THE
PORTER-ALLEN STEAM ENGINE
SINGLE, COMPOUND & TRIPLE.
REVERSING ENGINES.
BESSEMER & BLAST FURNACE BLOWING ENGINES
WEISS COUNTER-CURRENT CONDENSERS.